CORAL GABLES
THE CITY BEAUTIFUL

P25 Digital Public Safety Radio System

COMMUNICATIONS INTERNATIONAL

January 2015

January 13, 2015

Coral Gables Police Department
Attn: Edward J. Hudak, Jr., Interim Police Chief
2801 Salzedo Street
Coral Gables, FL 33134

Re: Project 25 Digital Public Safety Radio System

Dear Chief Hudak,

On behalf of the Communications International (Ci) team, I would like to thank the City of Coral Gables for the opportunity to share your vision for such a vital community project. The Ci family has grown up serving Florida public safety professionals nearly forty years and has a twenty year relationship with your fine city. I speak for the entire Ci team when I say this project is a major priority for us and a great source of pride for our company and our community.

At Ci, many of us are former Public Safety and Military personnel so we understand the importance of reliable and future ready radio systems. Public safety demands excellence in their communications and the Ci team has designed critical features for the area. Using proven technology and system design we will meet and exceed the requirements to provide the following key benefits to Coral Gables user community.

- Technology Refresh to critical obsolete components with a hassle free cutover with minimal disruption to Standard Operating Procedures.

- Only Harris equipment can provide the level of Mission Critical Communications and interoperability the City desires. (VDOC)

- Competitive pricing using the Hillsborough County Sheriff procurement contract.

- Common equipment with Miami Dade County and Aventura in case of disaster.

Ci looks forward to continuing an already successful twenty year relationship with Coral Gables and providing for the effectiveness, safety and security of the City's First Responders. We are confident that after evaluating our offer, Coral Gables will determine that our solution and pricing options are the best choice. Please contact me at (772) 321-2732 or mhinckle@ask4ci.com to answer any questions. On behalf of our entire company, I thank you for the opportunity to present this solution and to be a part of your continuing efforts to provide your officers with the tools they need to serve the community.

Sincerely,

Matthew S. Hinckle
Director of Sales
Communications International, Inc.

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City of Coral Gables, FL

THE CITY OF CORAL GABLES, FLORIDA

P25 DIGITAL PUBLIC SAFETY RADIO SYSTEM
REQUEST FOR PROPOSAL (RFP)

ci COMMUNICATIONS INTERNATIONAL

REPLACEMENT OF OBSOLETE TECHNOLOGY

1990's TECHNOLOGY

The current EDACS system deployed by the City of Coral Gables was designed and implemented in the mid-1990's. While the system has served the City well for almost two decades, many of the components are no longer supported. For example many of the dispatch consoles are operating on a Microsoft Windows NT platform. These obsolete devises are a mission critical failure point in the operation of your public safety communications system.

The proposed Harris P25 Phase II communications system will bring all aspects of your radio communications to state of the art technologies. With this new communications system, the City and its residents can rest assured that they have a stable and reliable platform for today and the future.

- **Replace obsolete dispatch consoles**

- **Proactively replace future obsolete equipment**

- **Ensure Mission Critical Communications**

GUARANTEED COVERAGE
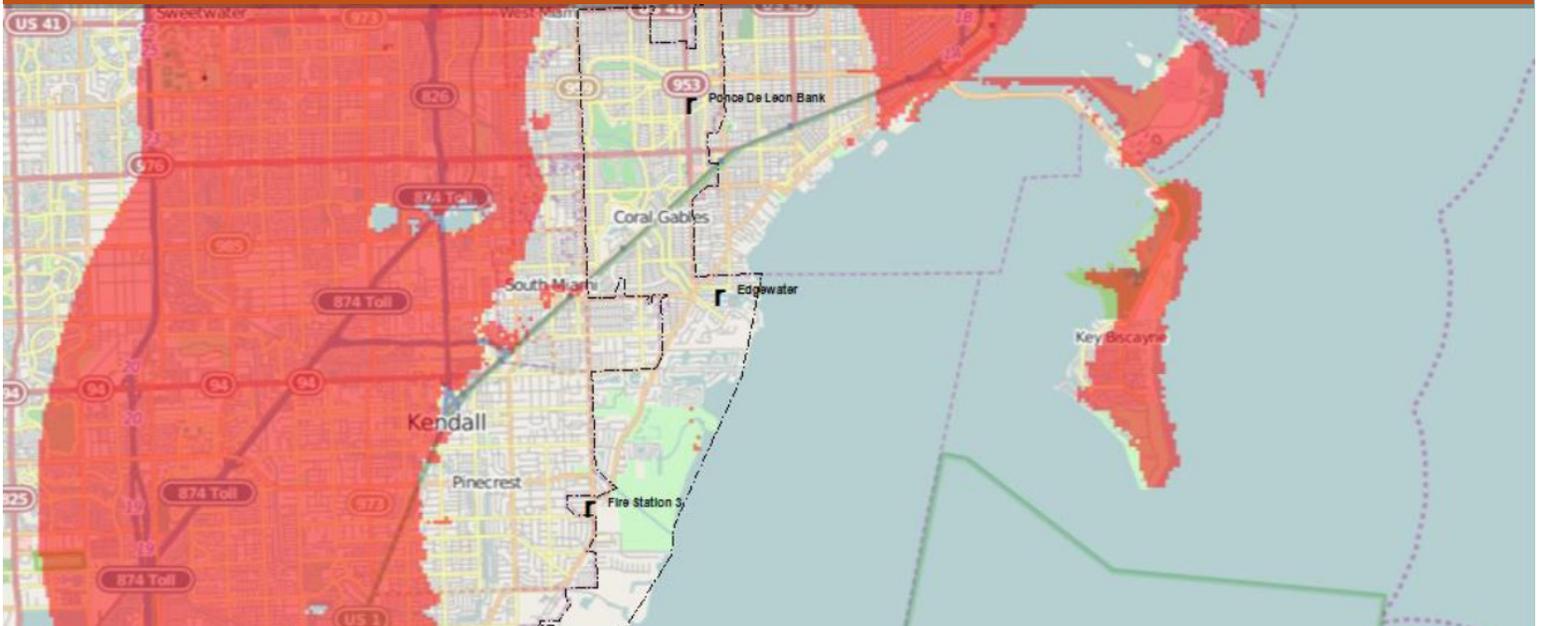
OPTIMIZED DESIGN. MAXIMUM COVERAGE

Our design is guaranteed and based on our extensive experience with Coral Gables' current Harris EDACS radio system, local knowledge of the area and thorough understanding of our radios real-world performance

Configured as a three-site Linear Modulation Simulcast network, Coral Gables's new P25 system will deliver 95% portable coverage throughout the City. Strategically located sites and antenna systems are engineered to maximize in-building coverage in the City. This optimized design provides coverage directly from the tower sites and minimizes the need for in building signal amplifier systems.

⇒ **95% portable outdoor**
⇒ **Digital Audio Quality 3.4**
⇒ **Linear Modulation Simulcast**

THREE SIMULCAST SITES

FIRE STATION 3
BANK BUILDING
EDGEWATER

> We rely heavily on Ci's expertise, knowledge and performance in support of our communications systems.
>
> - Hillsborough County, FL

A P25 SOLUTION THAT KNOWS NO BOUNDARIES

COMMUNICATIONS INTERNATIONAL

100% FULLY COMPLIANT AND FUTURE READY

The City of Coral Gables is taking a bold and important step to ensure the continued reliable communications for its public safety community. Communications throughout the city and region is of critical importance, and a dependable radio system is a cornerstone of every City.

As the specification document makes clear, the city seeks to upgrade its public safety radio system by implementing standards-based P25 Phase 2 technology, improving citywide portable coverage and establishing seamless interoperability pathway with agencies throughout the region.

- ♦ **SMOOTH MIGRATION TO P25**
- ♦ **REPLACE CRITICAL OBSOLETE COMPONETS**
- ♦ **GUARANTEED COVERAGE**
- ♦ **THE MOST EXPERIENCED EDACS TO P25 PARTNER**

SOLUTION SNAPSHOT

	Description
Number of Sites	3 sites, Linear Modulation Simulcast
Channels	10 800 MHz channels
Coverage Guarantee	95% portable outdoor
Operating Modes	P25 Phase 1 & 2 and EDACS (network/radios)
Dispatch Consoles	12 consoles
Site Connectivity	2 hops, 50 MBps microwave network
Interoperability	"One-button" EDACS, P25, 700 MHz, P25 ISSI

Ci is the largest Systems Integrator for Harris nationally and in Florida. Ci's presence throughout the State offers "next-door" support and continuity of the same project staff from project start.

Ci is "A Trusted Pubic Safety Partner".

BATTLEFIELD PROVEN TECHNOLOGY

ENHANCED DYNAMIC DUALMODE

Exclusive Harris technology feature enables seamless operations on P25 Phase 1 and Phase 2 on any channel at any site. Other vendors require dedicated channels or sites that could result in capacity and operational issues.

BeOn TODAY. LTE TOMORROW

Harris is leading first responders into the next generation of critical communications with a forward-thinking solution encompassing LTE broadband, secure satellite backhaul, rugged LTE end user devices and intelligent applications. The Harris LTE solution provides first responders with fast, mission-critical information at their fingertips that can improve local coordination and response.

HIGH RELIABILITY AND REDUNDANCY

Harris is the leading global supplier of secure radio communications and embedded high-grade encryption solutions for military and government organizations. The City of Coral Gables needs a reliable public safety radio network for daily operations and major disasters or emergencies. Ci's proposed solution provides a redundant, fault-tolerant network designed to tolerate single points of failure. Redundancy and reliability are achieved throughout the system including:

- Redundant and geographically distributed control points for over-the-top reliability
- Enhanced Failsoft with Security
- Distributed database information at each site
- Remote back-up dispatch capabilities

CORAL GABLES SYSTEM DESIGN

Harris P25 Phase 2 infrastructure

- 3-site, Linear Modulation Simulcast P25 Phase 2 system capable of voice and data
- EDACS Migration Gateway for seamless integration of EDACS network and radios
- Existing tower sites
- New antenna systems
- 50 MBs microwave network with hot-standby configuration
- 12 Symphony dispatch consoles

AWARD WINNING SYMPHONY™ DISPATCH CONSOLES

The new, state-of-the-art Symphony platform provides dispatchers complete control to adapt as priorities and as needs change. With 16 user-definable screens, up to 8 speakers and 1,000 group modules, the Symphony is ideal for Coral Gables; dispatch operations. Since it is an IP-based console, it does not require audio towers, electronic banks or direct connection to a Master Site. The unit will interface to the P25 system through a LAN-based connection and share voice encapsulated data packets on the county's secure IP network. Dispatchers can configure their working environment with graphics, features, and functions that work best for them. Console screen setups can be configured to improve efficiency and productivity. Screen configurations can be created for scenarios ranging from crisis situations to shift/staffing changes.

A SEAMLESS MIGRATION

THE MOST EXPERIENCE WITH EDACS TO P25 MIGRATIONS

It's important for communications to continue without disruption. Ci has the most experience transitioning EDACS customers to P25 agencies. With over 12 major EDACS/P25 networks in Florida alone, Ci has is the only vendor with this level of in-depth experience. Our migration program combines exclusive services and technology including:

- "One-button" interface to Harris systems
- EDACS Migration Gateways for seamless interconnection to the new P25 system
- Leveraging your existing radios. We will upgrade your radio software to enable radios to talk on EDACS and P25 Phase1/Phase 2 networks
- Maintenance and support abilities that allow you to keep your in-house capabilities
- Radios capable of simultaneous, multi-system scan of P25, EDACS and other vendors' systems

TAILORED TO MEET YOUR NEEDS

A SUCCESSFUL HISTORY WITH THE CITY OF CORAL GABLES

Transitioning to a new radio system is a significant undertaking. Our intimate local knowledge of your radio system and operations over the past 17 years will be part of our approach to design, deliver and support your new P25 network.

CORAL GABLES' NEEDS	OUR SOLUTION TO MEET YOUR NEED
GUARANTEED COVERAGE	Ci's design guarantees 95% portable outdoor coverage and 95% indoor coverage that meets or exceeds your requirements
A SMOOTH MIGRATION	Ci has the most experience migrating Harris EDACS systems to P25 in Florida. An EDACS migration gateway will provide a smooth transition with no downtime and a seamless end-user experience
LOW TOTAL LIFECYCLE COST	We reuse and upgrade your current radio inventory, to deliver a low total cost initially and ongoing
HIGH RELIABILITY	Geographically redundant control points, critical database backups and a fault-tolerant IP network architecture that provides uninterrupted communications even if IP links are disrupted
SEAMLESS INTEROPERABILITY	Multiple levels of interoperability including 'one-button direct interoperability with EDACS and P25 users as well as a P25 ISSI for inter-system connectivity between P25 networks
ONGOING SUPPORT	As the exclusive Harris Regional Center of Excellence in the Southeastern U.S., Ci has a network of 7 service centers in Florida, including a Miami facility nearby
EXPERIENCED PARTNER	Ci has over 40 years of experience implementing and supporting public safety trunked radio system networks .

" If not for Ci's knowledge base, support, technical members and strategies; the current project would not have been a success.

- Temple Terrace PD

A STRONG LOCAL PRESCENCE

A SERVICE NETWORK THROUGHOUT FLORIDA

Ci has a local presence all over Florida. Ci has provided to service and support and for public safety communications systems throughout Florida and the United States for over 40 years. With nearly 200 employees-owners, Ci has the resources and experience to support the City of Coral Gables.

- ◆ 80 technicians and service support personnel

- ◆ 11 system engineers

- ◆ Regional Service Center in Miami

- ◆ An employee owned company that sends an owner out on every call

- ◆ Ability to continue your in-house maintenance

- ◆ Backed by Ci's Service Organization Network including 7 facilities throughout Florida

- ◆ The exclusive Harris Regional Center of Excellence for all 50+ Harris dealers in the eleven southern states

- ◆ Harris Master Integrator, Distributor and Regional Center of Excellence with factory trained engineers, technicians and project managers

WHY Ci FOR THE CITY OF CORAL GABLES?

UNMATCHED BY ANY OTHER VENDOR.

Ci offers a unique solution to the City of Coral Gables that no other vendor can. Our turnkey solution provides the latest technology, most experienced/capable services in an approach that benefits the City immediately and well into the future.

⇒ **SMOOTH MIGRATION TO P25**

⇒ **GUARANTEED COVERAGE**

⇒ **LEVERAGES REGION AND STATE RESOURCES**

⇒ **USES EXISTING RADIOS**

⇒ **ADVANCED P25 TECHNOLOGY**

⇒ **THE MOST EXPERIENCED EDACS TO P25 PARTNER**

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"

Ci has provided us with exceptional service and solutions. We depend on Ci and they have never let us down.

Brevard County, FL

COMPANY INFORMATION

Ci COMPANY PROFILE

Providing Enduring Quality

Communications International "Ci" is not the new kid on the block. As an employee-owned company with seven offices in Florida alone, we have been serving public safety critical communications needs for nearly four decades. Our history is one of integrity and true partnership. We do not sell product and then walk away from responsibility, no matter what the circumstance. We live here—we are headquartered here—and the same systems we install and support provide public safety critical communications we depend on as Florida residents. Our customers have been loyal to us since the business started in 1975, and this loyalty is based on honesty, fairness, and performance.

Our success over the years is a direct result of superior service. Everyone understands that service enhances system longevity and user satisfaction. This customer service standard was infused in our business model from the beginning and continues as a hallmark of Ci's success in the public safety market. This true partnering relationship is a recognized benefit of Ci-supported public safety agencies across Florida, the U.S. and internationally. Regardless if the need is for new terminal products, a new system design, project planning for a new technology upgrade, tower construction for improved and expanded coverage needs, system troubleshooting, or to get engaged with the user community for needs analysis and issues resolution, you can rely on Ci.

- Employee-owned company since 2010

- Received Indian River's "Best Places to Work" award October, 2012

- Our company staff of nearly 180 employees: engineers, technicians, project managers with PMP certifications, and subject matter experts—all dedicated to providing our customers the very best in public safety critical communications.
- Seven service facilities throughout Florida with largest office in Tampa, FL

- Strong software competence through our software company, FATPOT Technologies

- More than 240 active contracts with over 200 State and Local Government agencies

- Loyal customers provide a majority of our revenue and have been with us an average of 10 years

Providing Enduring Value

Ci has grown to be the largest Systems Integrator for Harris nationally and in Florida. Customer confidence has driven this growth based on Ci's proactive approach to offer "next-door" support and continuity of the same project staff from the design phase to project completion. The significance of this practice has been demonstrated to customers over many years. At any time, Coral Gables has access to Ci as a company, the entire project team and senior management, design engineers and technicians. This provides accountability and assurance that everything proposed in the contract is executed according to plan and that any questions or concerns are addressed immediately. This is our promise and why customers have trusted us with their communication needs.

Experience has taught us that equipment alone does not provide the total value that customers experience with Ci. We invest in gaining a full understanding of our customer's operations and how radio communications can be used to help facilitate and enhance your operations. This is accomplished by defining and prioritizing initiatives, setting clear expectations regarding the project's deliverables, expected benefits, scope, cost, and implementation plans. After we define your project, we finalize the design that meets your needs. We work with you to refine our plan and ensure the project's success. Led by Project Management Professional (PMP) certified Project Managers, to deploy your solution, our implementation team works in tandem with your staff to ensure a smooth transition to the new system. Finally, we validate the successful completion of our project through comprehensive acceptance test plans to ensure we met the project goals and deliverables. Our proven approach continues to focus on you as we provide training and on-going maintenance and support for your system.

> The Ci Value Proposition
>
> *When it comes to providing Systems Integration Services, no one does it better. Ci gives you the knowledge and experience you expect from an industry leader with the personal attention you deserve.*

Our implementation methodology has been refined through the years and is a key value we provide our customers. An example is Ci's installation and support of Harris EDACS public safety systems in Hillsborough, Indian River, Volusia and Brevard Counties for over 18 years.

RELY ON Ci. WE'RE RIGHT THERE WITH YOU.

Providing Future Assurance

Technology changes such as new IP-based packet switched systems, software enhanced radios, Over-the-Air Re-Keying (OTAR) and Over-the-Air Programming (OTAP) features, standards bodies like APCO and P25 Phase 1 and Phase 2 compliance, and the focus on public safety broadband demands customers make good decisions when in the market to purchase new equipment. Wading through the advantages and tradeoffs of any manufacturer's equipment requires a solid technical knowledge, evidence of strong past performance, and the ability to attain assurance that what you purchase today will meet your needs for tomorrow and beyond – both from an equipment performance and support perspective.

When the State of Florida was pursuing a Statewide Law Enforcement Radio System (SLERS) network, Harris equipment and Ci as the integrator were selected. Ci staged and implemented the system and was contracted for the ongoing maintenance of the radio and microwave networks. Ci coordinated the inventory, delivery, installation and testing of more than 7,000 radio units. The equipment was divided among eight designated locations and deployed throughout the State of Florida.

"Our goal is to harness all of our mission critical information and create one clear picture to keep our radio communications strong, and our citizens safe. As such, we need a flexible, robust solution that will help New Bern migrate to state-of-the-art technology without costing a fortune – and Ci's network provided the perfect fit."

Frank Palombo
Recently Retired Police Chief
New Bern, NC

PROFESSIONAL STAFFING

- ❑ Focused technology partner and service provider serving State and Local, Finance and Public Sector agencies

- ❑ OEM software developer and solutions provider (FATPOT)

- ❑ Well versed hardware, software, and services

- ❑ Well positioned for continued strong organic growth

- ❑ Robust customer base and relationships

- ❑ Strong corporate culture with a tenured management team and highly skilled workforce

Employees and locations

- ❑ Daytona Beach, FL
- ❑ Rockledge, FL
- ❑ Vero Beach, FL
- ❑ Tampa, FL
- ❑ Naples, FL
- ❑ Miami, FL
- ❑ Goldsboro, NC
- ❑ Lynchburg, VA
- ❑ Mt. Juliet, TN
- ❑ Portland, OR
- ❑ Salt Lake City, UT
- ❑ Boston, MA
- ❑ Ontario, Canada
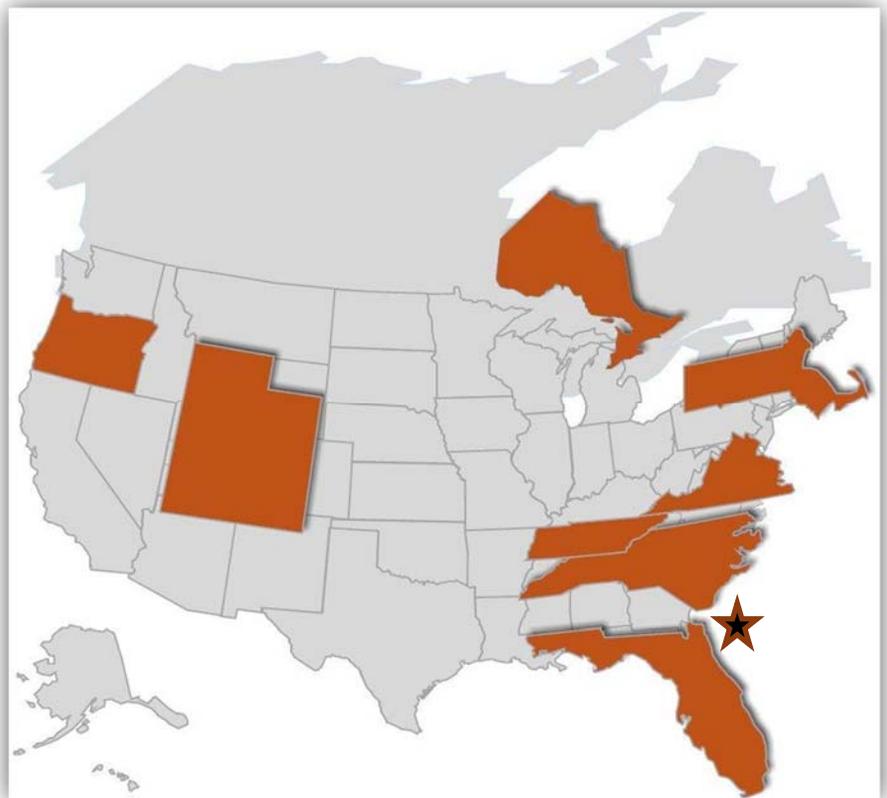
Communications International Headquarters – Vero Beach, Florida

RELY ON Ci. WE'RE RIGHT THERE WITH YOU.

Employee mix
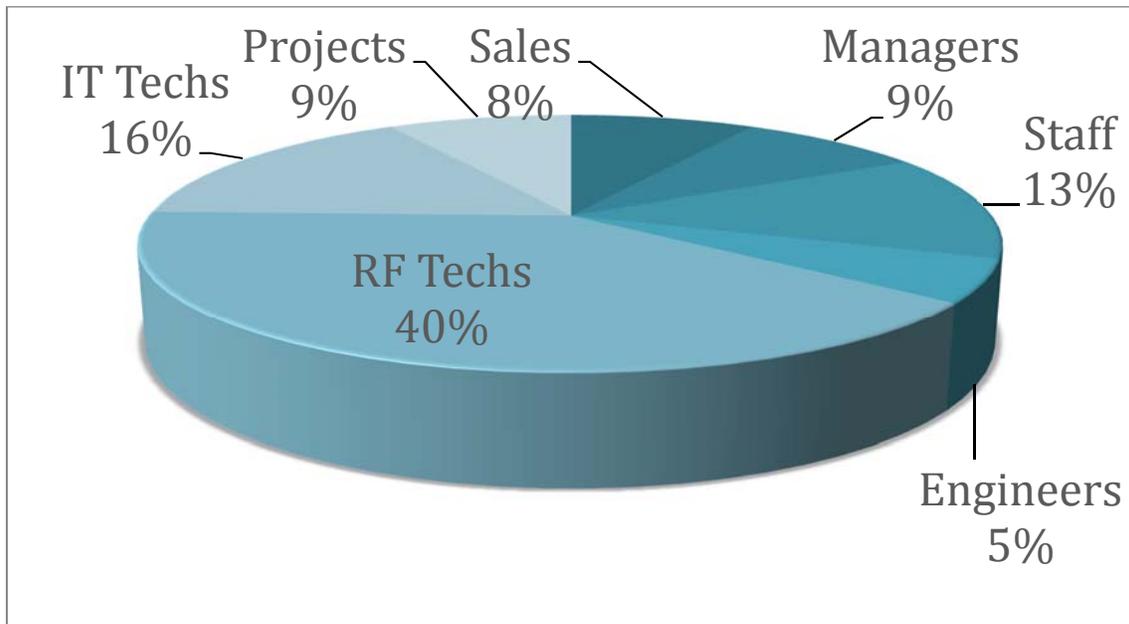
What we do: the Ci services pyramid
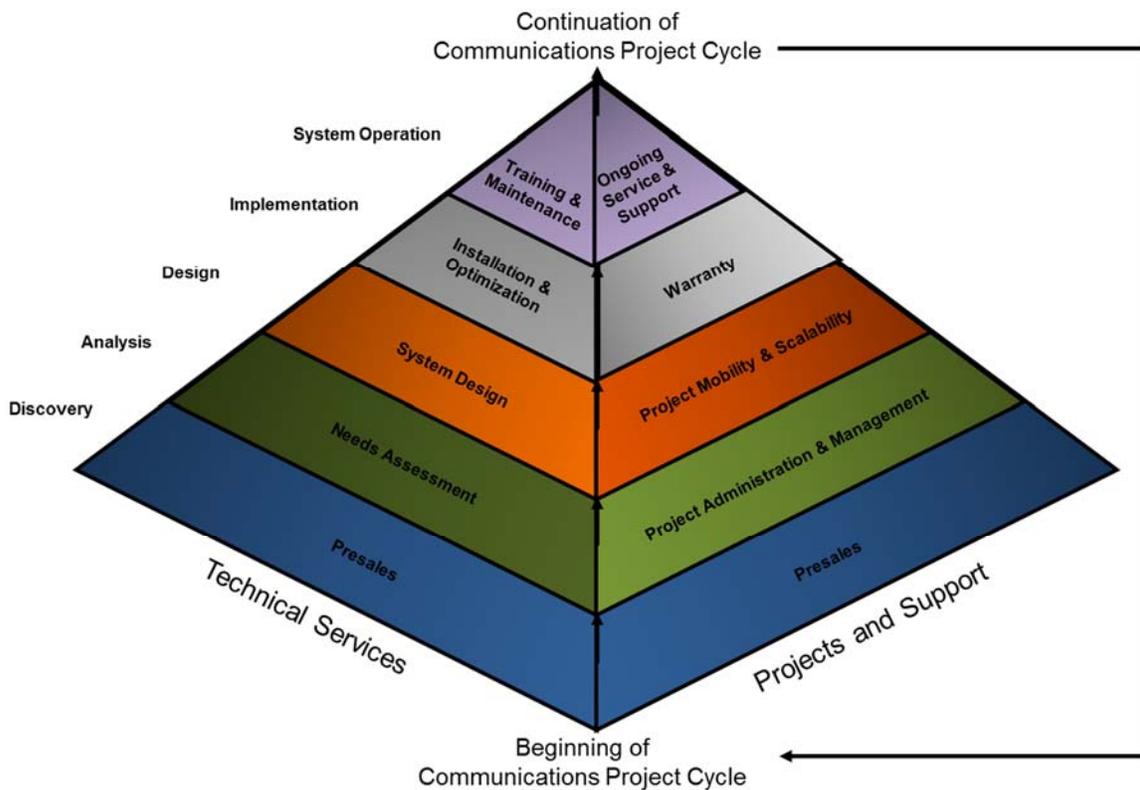
Project planning

→ Feasibility Studies
  → User Groups
  → Site Surveys
  → Needs Analysis
  → Product/Technology Research
  → Conceptual Design
  → Requirements Definition
  → Interoperability Planning
  → Solutions Architecting
  → Budgetary Estimates
  → Procurement Management
  → RFQ/RFP Creation (Consult, Develop, Respond)

System design

→ RF Coverage
  → System Expansion
  → Fill-In Sites
  → System Design

→ Network Architecture
  → Radio-IP Networks
  → Backhaul Systems
  → Databases/RMS
  → Applications
  → Voice
  → Data
  → Video

System implementation

→ Site Construction and System Install
- → Installation Planning and Oversight
- → PMP® Project Management
- → Factory Staging and Configuration
- → Test & Turn-up
- → Training Courses
- → For End Users
- → For System Administrators
- → Maintenance Services
- → Technical Support
- → Tier 1-3 Helpdesk
- → Inventory Management

Field tech services

→ Subscriber Unit Reconfiguration
- → Retuning, re-flashing, and/or reprogramming subscriber units
- → Removal/installation of mobile equipment in vehicles
- → Removal/installation of dispatch consoles, call boxes, SCADA terminals
- → Creation of code plugs/programming templates
- → Infrastructure Reconfiguration
- → Install/Removal of temporary/loaner equipment
- → Reconfiguration of paging controllers, repeaters, receivers, and BDA's
- → Reconfiguration of transmit combiners, receive multi-couplers, tower top amplifiers, antennas, and feedline elements
- → Oversight/Audit of Local Radio Shop Work

COMMUNICATIONS INTERNATIONAL

RELY ON Ci. WE'RE RIGHT THERE WITH YOU.

CUSTOMER BASE

Strong customer relationships

- Brevard County, Florida

- Indian River County, Florida

- Hillsborough County, Florida

- Boston, Massachusetts

- State of Florida Law Enforcement

- State of Florida Department of Corrections

- Massachusetts Bay Transit Authority

- Florida Power and Light

- Volusia County, Florida

- York County, Pennsylvania

- Trinidad and Tobago

Chart: Years Providing Service

Customer	Years Providing Service
Harris Corporation	40
Brevard County, FL	25
Collier County, FL	16
State of Florida	16
Volusia County, FL	22
Hillsborough County, FL	16
State of Utah	10
Johnston County, NC	14
Wayne County, NC	14
Flagler County, FL	9
MBTA, MA	9
Indian River County, FL	35
State of Missouri	4
New Bern, NC	4
Orange County, CA	2
Ministry of Health, Canada	3

Years Providing Service

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RELY ON Ci. WE'RE RIGHT THERE WITH YOU.

Projects history

Ci has tackled projects large and small, simple and complex, new implementations and upgrades. From Las Vegas to Boston and from Trinidad to Tasmania, we're experts with domestic and international experience.

Here are just a few of our success stories.

BREVARD COUNTY, FL

CITY OF NEW BERN, NC

VOLUSIA COUNTY, FL

FRANKLIN COUNTY

HILLSBOROUGH COUNTY, FL

UTAH

INDIAN RIVER COUNTY, FL

BOSTON, MA

STATE OF FLORIDA

TRINIDAD AND TOBAGO

ORANGE COUNTY, CA

ONTARIO COUNTY, NY

Partnerships

Ci has developed strategic partnerships with the leading manufacturers in the communications arena to best meet your specific needs.

Our partners include:
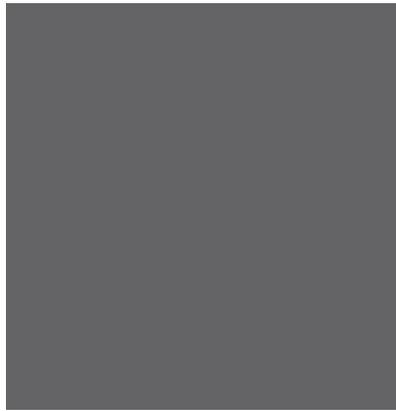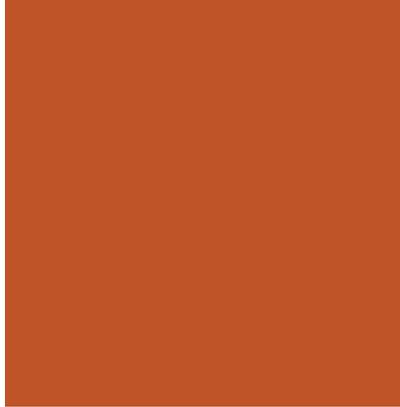
Rely on Ci.
We're right there with you.

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RELY ON Ci

With a history spanning four decades, Communications International is privileged to serve the Public Safety and Mission Critical communications markets. We are your innovative Systems Integrator with the experience and specialized capabilities to design, implement, service and unify your critical communications. One vendor that works for you – bringing together the best of breed technologies, proven methodologies, and the commitment and expertise from more than 200 employee owners.

DELIVERING INTEGRATED SOLUTIONS

Emergencies know no boundaries. First Responders must communicate regionally, across jurisdictions and with legacy technologies. Ci delivers custom solutions and turnkey services to enable reliable communications across regions while allowing agencies to get the most from previous investments in systems, software and resources.

As a Public Safety Systems Integrator, Ci works with and supports technologies from competing manufacturers to give you a best of breed solution that includes the best technologies and the services that you need. We are your single point of accountability – the one vendor that you can rely on to design, deliver and support a unified solution.

The economic climate requires you to get the most out of your resources and previous investments. Reject the typical "forklift upgrade mentality" from vendors who propose costly full system replacements and take a new approach with Ci. We are evolution experts, able to incorporate, support and service legacy systems while adding in new elements as needed.

OUR SOLUTIONS INCLUDE:

|		
Wireless Networks	Records Management Systems Software	Information Sharing
User Devices, Parts, and Accessories	Automatic Vehicle Location Systems	Microwave Systems and Site Connectivity
In Building and Outdoor Coverage	Automatic Field Reporting Software	Next Generation 911 Systems
Voice Interoperability	Custom Software Solutions	Dispatch Centers and Consoles
Software Applications	Data Interoperability	

A PROVEN APPROACH

To deliver a solution that truly achieves your goals, our experts take your project from concept to completion and beyond with a proven approach.

The collaborative efforts of our teams focus on **Listening** to you so we can **Discover** your needs, challenges, and opportunities. Together, we **Define** your desired "To Be" state. From this point, we work to delineate and prioritize initiatives, setting clear expectations regarding the project's deliverables, expected benefits, scope, cost, and implementation plans. We seek to prevent surprises and eliminate the potential for "scope creep."

From this project definition, we **Design** a solution that meets your needs. We work internally and with you to further **Develop** our plan to ensure the project's success. Led by PMP certified Project Managers, we **Deploy** your solution. Our implementation team works in tandem with your staff to ensure a smooth transition to new technology.

Finally, we **Validate** the successful completion of our project through a comprehensive acceptance test plan to ensure we met the project goals and deliverables. Our proven approach continues to focus on you as we provide **Training**, on-going **Maintenance** and support for your system.

FATPOT® PUBLIC SAFETY SOFTWARE

Information Sharing. Situational Awareness. Mobility.

Referred to as the "Google" of Public Safety Software, our software company, FATPOT Technologies created the revolutionary software platform, Peer Intelligence,® to enhance and automate public safety operations. We enable First Responders to react faster, share knowledge instantly, and communicate securely to achieve true situational awareness while utilizing legacy software, resources and investments.

FATPOT's powerful Fusion software unifies applications and systems to transform how First Responders use technology to reduce response times and increase safety in multi-agency operations. Your existing public safety software (CAD, RMS, AVL) systems seamlessly connect in real time to provide you the "big picture" across agencies and regions, regardless of the vendors, vintages or versions involved.

FATPOT's innovative Application software delivers simple, elegant, intuitive and lightning fast user experiences to facilitate Smart Policing, significantly lower response times, promote First Responder community presence and reduce occurrences of costly errors and duplications.
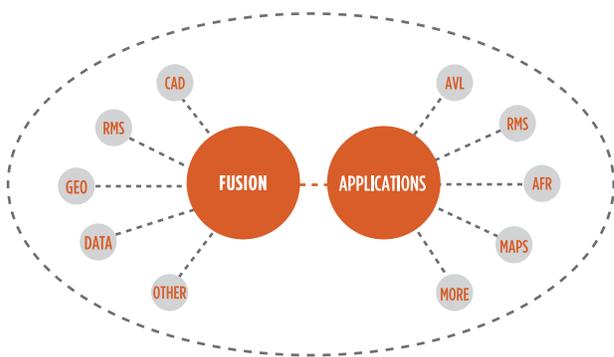
FATPOT software provides two main types of solutions: Fusion and Applications. Fusion software connects all disparate systems in real time no matter the vendor, vintage or version to provide true data interoperability. Application software provides a suite of powerful tools to automate and enhance public safety operations.

WE'RE RIGHT THERE WITH YOU

Nearly forty years ago, our company was founded on service – it's in our DNA. Whether implementing complex wide area systems, enhancing existing networks, or providing ongoing maintenance and support, our proven methodology, employee-owner mindset and total aversion to internal bureaucracy delivers results – guaranteed.

Ci specializes in designing custom solutions tailored to fit your communications objectives, budget and timeline. We work closely with you to set clear expectations regarding the project's deliverables, expected benefits, scope, cost, and timing. This up front planning ensures we meet your needs while eliminating any "scope creep" or surprises.

When it comes to providing System Integration Services, no one does it better. Ci gives you the knowledge and experience you'd expect from a manufacturer with the personal attention you deserve.

OUR SERVICES INCLUDE:

System Engineering	Custom Software Development	Software Integration
Network Optimization	Site and Project Management	Tower and General Construction
Equipment Calibration	Installation and Maintenance	Training

2

"Ci has provided us with exceptional service and solutions. We depend on Ci and they have never let us down."

Lesley Lewis
Communications Director, Brevard County, Florida

"FATPOT's system provides a protective technological layer that connects our first responders and makes our communities safer. FATPOT's real-time information-sharing software saves lives. The key to homeland security is interoperability, and that's what FATPOT provides."

Mark Shurtleff
Attorney General, State of Utah

"Our team was looking for a simplified, flexible solution that could offer robust, reliable communication to protect and serve citizens of each community across the Metro Boston area. Ci delivered just that, and we are pleased with the outcome."

Officer Scott Wilder
Director of Technology, Brookline Police Department
Chairman, Metro Boston Urban Area Security Initiative Committee

"This is a true enhancement for the Missouri State Highway Patrol. With more than 800 MSHP officer vehicles equipped with FATPOT's system, we are able to more effectively track emergency calls, offer greater situational awareness and most importantly, increase trooper safety. By streamlining our reporting process, MSHP officers can devote more time patrolling Missouri's highways and providing the best service to the citizens of our state."

Captain Kim Hull
Director of Communications Division, Missouri State Highway Patrol

"We wanted the same people that designed our system to be the same people that configure, implement, test, and maintain it. That's why we rely on Ci."

Bill Clausen
IT Communications Manager, Volusia County, FL

"Canada's Ministry of Health and Long-Term Care relies on FATPOT software to help in its efforts to establish a patient-focused, results-driven, integrated health system. The Ministry's EMS TIF Program depends on FATPOT CADFusion software to connect over 25 Public Safety software systems in real time throughout the Province."

Ministry of Health
Province of Ontario, Canada

ci COMMUNICATIONS
INTERNATIONAL

WE'RE RIGHT THERE WITH YOU
1.888.275.4244 • WWW.ASK4CI.COM

Ci DETAILED REFERENCES

With a history spanning four decades, Communications International is privileged to serve the Public Safety and Mission Critical communications markets. We are your innovative Systems Integrator with the experience and specialized capabilities to design, implement, service and unify your critical communications. One vendor that works for you – bringing together the best technologies, proven methodologies, and the commitment and expertise from nearly 200 employee owners.

Ci has tackled projects large and small, simple and complex, new implementations and upgrades. From Las Vegas to Boston and from Trinidad to Tasmania, we're experts with domestic and international experience.

Here are just a few of our success stories.

PROJECT NAME: Hillsborough County Sheriff's Office Radio System

LOCATION: Hillsborough County, Florida

NAME OF CONTACT: Steven Mitchell

PHONE: 813-247-0715   **E-MAIL**: smitchel@hcso.tampa.fl.us

DESCRIPTION OF SERVICE: In the mid-1990s, Hillsborough County, Florida, installed two 15-channel 800-MHz simulcast systems (east and west) to provide county-wide radio coverage to police, fire, public schools, and public works agencies. Ci has been successfully providing maintenance and support on these systems for 19+ years, and the system was very reliable. In 2007, the manufacturer announced end-of-life on their system so the County began a system wide upgrade and migration toward P25 equipment. In 2009, the County contracted with Ci for two projects:

- Replace the 5-site west simulcast system with a newer 8-site simulcast system (successfully completed in October 2009)
- Expand the east from 7 sites to 10 sites, using parts harvested from the vintage west system.
- As part of an effort to support the 2012 Republican National Convention Ci was contracted to design and install a Harris 700 MHz P25 system. The two site, ten channel simulcast system served as the main interoperable solution for the hundreds of law enforcement agencies that provided security for the convention.

Hillsborough County, FL
The LARGEST 700/800 MHz Trunked Radio System in Florida

- Ci was the sole company to design, sell, and install the Hillsborough Simulcast System

- The system includes:
  - Three simulcast cells totaling 22 sites
  - A mix of P25 and EDACS
  - 10,000+ subscriber units

- The primary communications system for the 2012 Republican National Convention

- Has regular interoperability with Pinellas County (Motorola P25)

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- Integrate Harris next generation core switch with Migration Gateway technology to allow for interoperability between the existing EDACS system and the new P25 700 Mhz Phase 2 regional system. (successfully completed in September 2014).
- Upgrade existing microwave system with Alcatel 8000e series Ethernet based radios to include Multiprotocol Label Switching (MPLS) devices. Ci successfully integrated 17 hops of microwave to include new waveguide and antennas which was completed in October 2013.

The current Hillsborough County system consists of three simulcast cells with a total of 21 sites supporting over 10,000 users.

"Communications International provides our office with Emergency Maintenance Service, Routine Maintenance Service and Annual Preventative Maintenance Service in support of our 800MHz Simulcast Systems and Microwave System. We rely heavily on their expertise, knowledge and performance in support of these systems."

- Steve Mitchell
Hillsborough County Sheriff's Office

PROJECT NAME: Aventura Radio System

LOCATION: Aventura, Florida

NAME OF CONTACT: Tom Labombarda

PHONE: 305-466-1336   **E-MAIL**: labombardat@aventurapolice.com

DESCRIPTION OF SERVICE: In the early 2000's the city of Aventura had a need for reliable communications, however the city did not own any frequencies. Aventura contacted Communications International to research available options. Ci was able to find some 800 MHz frequencies and provided the city with a single site EDACS system for communications. In 2010 Harris corporation, the manufacturer of the EDACS equipment, announced the end of support for the EDACS equipment at the end of 2017. In 2012 the City took proactive steps to ensure reliable communications and contracted with Ci for a state of the art Harris P25 communications system and terminals. The city knew of several coverage issues and worked with Ci to augment coverage with the installation of two VDOC sites. At the beginning of 2014 the single site 800 MHz P25 trunked network went operational ensuring mission critical communications for the next decade.

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30

PROJECT NAME: Brevard County Radio System

LOCATION: Brevard County, Florida

NAME OF CONTACT: Lizzet Ruiz

PHONE: 321-637-4074   **E-MAIL**: lizzet.ruiz@brevardcounty.us

DESCRIPTION OF SERVICE: Ci has installed, maintained, and supported the Brevard County 800 MHz EDACS countywide Public Safety radio system since 1989. The system includes over 6000 radios and involves 11 PSAP's all maintained by Ci.

The system currently is made up of 4 full TX/RX sites along with 3 Satellite RX sites which support 67 individual agencies including all municipal and county operations.

In 2012, Brevard County contracted Ci to upgrade the existing Harris EDACS™ radio network to a Harris ProVoice™ Digital Wide Area Network, consisting of three 800 MHz GPS Simulcast systems with a total of 8 sites, combined into a single unified network.

> "Ci has provided us with exceptional service and solutions. We depend on Ci and they have never let us down."
>
> *- Lizzet Ruiz*
> *Brevard County, Florida*

PROJECT NAME: City of New Bern Radio System

LOCATION: City of New Bern, NC

NAME OF CONTACT: Robert Boyd

PHONE: 252-639-2931   **E-MAIL**: boydr@newbern-nc.org

DESCRIPTION OF SERVICE: Ci was contracted in 2011 to design and implement a turnkey radio system that included a P25 Simulcast that included 2 sites with 11 channels, geo diverse network switching center, dispatch consoles, user radios, mutual aid network and services. This system provides guaranteed radio coverage to New Bern Police and Fire Departments, Carolina East Health Systems, New Bern Water and Electrical Utility Departments as well as state and local government public safety agencies.

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PROJECT NAME: Collier County GPS Upgrade

LOCATION: Naples, FL

NAME OF CONTACT: John Daly

PHONE: 239-732-2531   **E-MAIL**: johndaly@colliergov.net

DESCRIPTION OF SERVICE: Ci was contracted in 9/2008 to install Harris systems upgrades into seven countywide sites. Equipment placement included grounding, RF connections, and installation of GPS antennas, punch block connections and internal wiring. Ci aligned the simulcast and multisite IMC and performed the console and conventional interface level alignment and FVTP testing. Also, provided was the project management of the performed services along with Red Line drawings and Software audit. Ci currently maintains the system.

The current Collier system contains a five site simulcast system with three multi-cast sites covering the rural parts of the county. The consolidated dispatch center was updated in 2009 and has 24 C3 Maestro consoles.

PROJECT NAME: Volusia County Sheriff's Office Radio System

LOCATION: Volusia County, Florida

NAME OF CONTACT: Glenn Lopez

PHONE: 386-248-1774   **E-MAIL**: glopez@so.co.volusia.fl.us

DESCRIPTION OF SERVICE: The Volusia County EDACS system had been in use since 1995. It was deployed as 2 overlapping Master III simulcast systems. The system consists of one simulcast system "A" which has 14 channels located at 6 sites providing county-wide coverage, then a second county-wide system "B" which has 16 channels at 6 sites. The system currently supports over 40 different agencies with about 9000 users.

In 2012 Volusia contracted with Ci to design and implement a new Harris Voice Interoperability Data Access (VIDA) console platform for the County's consolidated dispatch center. Ci successfully completed the system in 2013 which includes 32 C3^{IP} consoles, a geo-diverse VIDA core and an EDACS interoperability gateway tied to the existing EDACS system.

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PROJECT NAME: Johnston County Radio System

LOCATION: Johnston County, North Carolina

NAME OF CONTACT: Jason Barbour

PHONE: 919-989-5111   **E-MAIL**: jason.barbour@johnstonnc.com

DESCRIPTION OF SERVICE: Ci has a strong and successful history of projects with Johnston County. Two of the most recent include a Microwave upgrade and a VIDA backbone upgrade.

Microwave upgrade - upgraded 2 Complete Microwave Links With Alcatel MDR 8000 Series 6 GHZ Hot Standby Microwave Radio System As part of the project Ci installed fiber optic links to support dispatch operations at both the primary and backup dispatch centers.

VIDA Backbone upgrade – Installed the VIDA console platform with 10 consoles at both the primary and backup dispatch centers. In addition the VIDA platform has all the necessary software and features to operate the Johnston County system as either EDACS or P25.

The current Johnston County system is an 800 MHz five site multi-site trunked EDACS system. The system has ten consoles at the consolidated dispatch center and serves over 2000 users.

CUSTOMER TESTIMONIALS

Sheriff of Hillsborough County

P.O. BOX 3371
TAMPA, FLORIDA 33601
PHONE 247-8000

David Gee

July 16, 2012

Mr. Robert Wm. Stork
Communications International, Inc.
4450 US Highway 1
Vero Beach, Florida 32967

Subject: Upgrades of 800 MHZ Simulcast Systems and
            700 MHz P25 System

Dear Mr. Stork:

My staff has advised that your firm has completed the upgrades and reconfiguration of our 800 MHz Simulcast Systems. The purchase of the equipment and services for these projects proceeded on the basis of two Letters of Intent from the Hillsborough County Sheriff's Office while grant funding was being processed. This relationship between your firm and this office enabled the West System and East System upgrades to be performed in the shortest possible timeframe.

The three sites added to the East System and the one site which was added to the West System has improved the overall radio coverage within the county. Your support and commitment enabled these system upgrades to be possible, allowing this office to move forward towards achieving our long-term P25 Standards migration goal. It has been brought to my attention that in addition to the upgrade of our 700 MHz P25 system from 5 channels to 10 channels, your firm is upgrading the 700 MHz P25 system to a 2 Site Simulcast System to further our P25 migration plan, resulting in greater interoperability with our participating region partners.

I would like to take this opportunity to express my gratitude for your firm's generosity in supplying the additional equipment and services for the expansion of the 700 MHz system as well as your personal support in achieving the successful upgrade and expansion of our 800 MHz Simulcast Systems.

Letter to Mr. Robert Wm. Stork
July 16, 2012
Page two

As always, please be assured of my cooperation in this and all matters of mutual concern.

Sincerely,
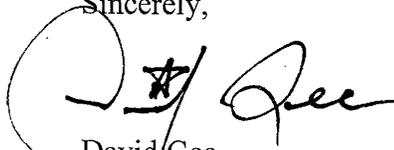
David Gee
Sheriff

DG/wds

CITY OF TAMPA

Terry Nehring
3701 N. 12th Street
Tampa, Florida 33603
October 29, 2014

Joe Ioco
Regional Service Manager
Communications International, Inc.
7792 Professional Place
Tampa, Florida 33637

Dear Joe:

The City of Tampa has been extremely satisfied with the level of service and support that your company has provided over numerous years. It is a pleasure working with a company that desires that same level of professional customer service, as I demand from my own employees.

This professionalism extends from the highest levels all the way down to your technicians, which has proven that they are kept up to date on all of the newest devices along with the appropriate training to quickly repair all of our issues.

During our transition from conventional to trunking, your company handled the extremely challenging installation schedule in a manner that was very accommodating to our users with minimal disruption in our capability to respond to our citizens calls for service.

I highly recommend Communications International to any agency that is considering hiring your company for any type of service or support.

Please feel free to include this letter in any response to bids that you are bidding.

Sincerely,

Terry Nehring
Electronics Superintendent
(813) 242-5332

HARRIS

April 20, 2012

Erich Lebeau
Key Accounts Manager
4450 US Hwy 1
Vero Beach, Fl 32967

Subject: Performance on Ontario County, NY site development project.

Dear Erich,

Even though Harris Corporation was not directly responsible for the site development work required on the Ontario County 700 MHz Radio System project, I was a very interested observer. As the Program Manager for Harris, it was important to ensure that the sites were going to properly house and support the new radio system that Harris will be installing. This letter is to let you know that I am very pleased with the outcome for Ontario, and my project.

As you know, the Ontario site development project included a number of new, green field sites, as well as several existing sites. The green field sites started out as raw land, with a range of site specific complexities. The work at existing sites ranged from fairly straight forward construction of concrete foundations and placement of generator shelters to complicated remodeling of existing buildings and facilities. The situation was further complicated by a division of scope between CI and another contractor. In every case, and at all times, I found the CI personnel and the CI subcontractors to be helpful, cooperative, and willing to work through issues as they arose. It was always clear that CI was intent on fully satisfying not only Ontario County, but also the county's consultant LR Kimball, and Harris Corporation. I will be confident, and I think other Harris program managers or customers should feel very confident about contracting with CI for other site development projects in the future.

I look forward to doing business with you again soon.

Yours truly,

David Adolf,
Program Manager.

Temple Terrace Police Department

**11250 North 56th Street
Temple Terrace, Florida   33617
813-506-6500
813-506-6499 FAX**
www.templeterrace.com

October 28, 2014

To Whom It May Concern:

Subject: Letter of Recommendation:

It is my pleasure to recommend the services of Ci (Communications International). During the past two years, I have worked directly with Joe Ioco, Regional Service Manager, and other members of Ci on a million dollar radio project. Ci offers top-notch quality service with integrity and proficiency. Across the board, I am always very pleased with their work, dependability and resourcefulness.

In particular, the radio project to which is in phase three of three, illustrates their attention to detail and concern for quality. If not for Ci's knowledge base, support, technical members, and strategies the current project would have not been a success.

From set-up to dealing with any matters, Ci has always been dependable, straightforward and honest.

I recommend Ci and look forward to our continued working relationship.

Sincerely,

Sheryl A. Shingleton
Services Division Commander

District School Board of Pasco County

Kurt S. Browning, Superintendent of Schools

7227 Land O' Lakes Boulevard • Land O' Lakes, Florida 34638

Transportation Services   727-774-0400   FAX: 727-774-0491
Gary Sawyer, Director   813-794-0400
6125 Pinehill Road, Port Richey, FL 34668   352-524-0400

To whom it may concern

In May 2014, I was tasked to resolve the radio issues we were having with our old 144 Mhz radio system consisting of 440 buses and two repeater sites. It was clear the system was overloaded and I was to seek out options in an effort to improve our current system allowing for future growth.

After contacting several possible vendors, I met with Communications International who wanted to see our current system and give proposals to improve our communications. It became clearly evident that it would be just short of impossible to use our system as it stood.

We were given an option of migrating to the current EDACS 800 Mhz owned by Pasco County. This would be a two-step process that would allow the county to migrate to the new P-25 system and allow the district space on their current system. This option would be a vast improvement over our current system, providing us with the reliable county wide communications that we require to operate in a safe and effective manner.

Ci was able to offer the district an opportunity to purchase and support the 440 radios and accessories outright at a significant savings to be ready for the time when we can fully integrate with the new system.

Currently, we have installed 120 of the 440 radios as we implement our migration in phases. This alone has eased the congestion on our communications systems. Ci programmed and installed the new radios for our dispatchers in five locations and also installed the radios in approximately 120 of our buses in 2 separate locations in record time.

I am very pleased with the abilities of Ci. Ci was able to meet a very stringent deadline and was available at all times to assist with any communications problems we might be having.
I highly recommend Communications International for any of your communication needs.

Emmett Thompson
Manager, Transportation Maintenance
Transportation Services

ZEPHYRHILLS POLICE

David Shears
Chief of Police

6118 8th Street • Zephyrhills, FL 33542 • Phone: (813) 780-0050 • Fax: (813) 780-0059
www.ci.zephyrhills.fl.us

October 28, 2014

TO WHOM IT MAY CONCERN:

The Zephyrhills Police Department has utilized Communications International as a vendor for our radio communication needs for many years. We have found this company is responsive to our needs, provides good customer service, and keeps us up to date on the current trends in the communications world.

Currently, we are partnering with Communications International in a replacement of our dispatch consoles, which is a major project.

I would recommend Communications International to you for consideration in your radio communications needs.

Sincerely,

Captain Robert McKinney

MANUFACTURER SUPPORT

October 16, 2014

Lt. Mike Frivola
Coral Gables Police Department
2801 Salzedo St
Coral Gables, FL 33134

This letter hereby indicates that Communications International is an authorized Harris Corporation, Regional Center of Excellence, (RCE). A Harris Regional Center of Excellence (RCE) is the highest designation for any Harris Channel Partner. Communications International is also the only Harris Authorized Service Center (ASC) in good standing and exclusive reseller assigned to the City of Coral Gables, FL.

Additionally, only Harris manufacturers console equipment that can interface with the Coral Gables EDACS system.

If you have any questions please do not hesitate to contact me at anytime.

Harris and Communications International look forward to the opportunity to provide services and sales support for this opportunity.

Sincerely,

Edward C. Muller
Manager, Indirect Channel
Harris Corporation
Public Safety & Public Service Division
Email: emuller@harris.com
Phone: (603) 275-0877

*assured*communications®

October 16, 2014

Lt. Mike Frivola
Coral Gables Police Department
2801 Salzedo St
Coral Gables, FL 33134

This letter hereby indicates that Communications International is an authorized Harris Corporation, Regional Center of Excellence, (RCE). A Harris Regional Center of Excellence (RCE) is the highest designation for any Harris Channel Partner. Communications International is also the only Harris Authorized Service Center (ASC) in good standing and exclusive reseller assigned to the City of Coral Gables, FL.

Additionally, Communications International is the only organization based in the Coral Gables Area with factory authorization and certification to maintain the new network switching consoles.

Due to the complexity and unique configuration of each communications network, Harris has an extensive training and certification process for channel partners to work on these public safety networks. Currently, only Communications International has this designation. If this status should change at some point in the future you will be notified by Harris Corporation in writing.

If you have any questions please do not hesitate to contact me at anytime.

Harris and Communications International look forward to the opportunity to provide services and sales support for this opportunity.

Sincerely,

Edward C. Muller
Manager, Indirect Channel
Harris Corporation
Public Safety & Public Service Division
Email: emuller@harris.com
Phone: (603) 275-0877

SYSTEM DESCRIPTION

RADIO COMMUNICATIONS SYSTEM DESCRIPTION

Project 25 Phase II Radio Communications Network

Solution Summary

Contemporary land mobile radio systems are complex. Hardware-centric, vendor-oriented systems have been replaced by software-centric, integrator-oriented *solutions*. Increasingly, public safety organizations need to incorporate emerging technologies in their critical communications systems in order to respond effectively to contemporary threats to life and safety.

In this environment, ***monolithic systems from one vendor rarely meet every unique operational need of today's public safety organizations***; contemporary radio systems typically require the expert integration of equipment from multiple manufacturers into a common operational environment. In addition, funding constraints often dictate that new systems incorporate legacy equipment, preserve existing CONOPS (Concept of Operations) /SOPs (Standard Operating Procedures), and reduce expenses associated with ongoing system operation and maintenance. ***These challenges require more than a vendor with an equipment portfolio; they require an independent, turnkey integrator partner with in-house engineering expertise and in-depth understanding of the client's existing systems, operational environment, unique constraints, and goals—a partner like Ci.***

> **The *Ci* Advantage**
>
> **"We wanted the same people that designed our system to be the same people that configure, implement, test, and maintain it. That's why we rely on Ci."**
>
> **Bill Clausen**
> **IT Communications Mgr.**
>
> **Volusia County, FL**

With our approach, rather than starting with a portfolio of equipment, Ci evaluates your current systems, assesses your needs, and develops a system that is right for you. ***The right equipment is only the beginning of a successful solution for the City of Coral Gables.*** A successful system will meet your current requirements for reliable, secure voice and data communications, dispatch operations, interoperability, and mutual aid, but needs to do more. A successful system must also provide platform support for future system expansion, rapid integration of new capabilities through industry-standard interfaces, and the addition of new—and yet to be invented—public safety software applications. Finally, a successful system design will facilitate successful implementation and migration to the new system by leveraging COTS equipment, support of existing CONOPS, and applying PMBOK™ best practices over the entire lifecycle of the system.

Ci has successfully applied our methodology to the design, implementation, and ongoing support of communications networks throughout the United States including coastal systems in Boston, Massachusetts, Brevard County Florida, Volusia County, Florida, Hillsborough County Florida, and the State of Florida SLERS system—the first state-wide simulcast system in the country. Further, Ci's in-depth knowledge of the City's existing operational environment, CONOPS, and legacy systems gained through many years of providing technical support services to the City give us ***technical, logistical, and operational insight into the city's communication systems needs that no other competitor can duplicate.*** These

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experiences will help us deliver the right solution for you while avoiding the real-world pitfalls that can derail project plans lacking full appreciation for the city's unique theater of operations, legacy equipment, and CONOPS.

Ci's Custom-Crafted Solution for the City of Coral Gables

For Coral Gables, Ci's staff of radio and IT engineering experts have drawn on almost a decade of hands-on work with the city's radio systems to craft a P25-compliant, 3-site, digital trunked simulcast radio communications solution built on the Harris VIDA™ network platform—the very first fully IP-based radio communications system with a track record of successfully delivering integrated, secure voice and data services in mission critical implementations for over a decade.

The proposed system meets or exceeds all of the city's coverage and operational requirements while leveraging existing radio system sites and facilities to maximize return on investment. While similar to other systems, Ci has successfully designed and implemented in coastal municipalities (including Boston, Brevard County Florida and Volusia County Florida), the proposed system is custom designed to satisfy all of the city's critical success factors as summarized in Table 1. *Look for the Critical Success Factor icons throughout the document* to learn more about these unique aspects of Ci's custom crafted solution for the City.

Table 1: Critical Success Factors for the City of Coral Gables Communications System

Critical Success Factor	How Ci's Design Delivers
Value	• *Use of existing radios whenever possible versus expensive replacements*
	• *Coverage exceeds requirements using identified towers*
	• *Maximum cost-effectiveness through the re-use of resources-shelters, towers*
	• *Uses existing EDACS system during migration to new system for a smooth transition*
	• *Enhanced Dynamic Dual Mode (EDDM) and Adaptive Site Resource Allocation (ASRA) optimize spectrum, and increase system capacity by enabling Phase 1 and Phase 2 communications*
Interoperability	• *Harris VIDA™ P25 platform can provide end user radios with "one button" interface to other Harris systems in the region such as SLERS*
	• *Harris radios support simultaneous, multi-system operations and scanning of P25, EDACS, and other vendors' systems*
	• *VIDA platform supports P25 Inter-RF Subsystem Interface (ISSI) for native P25 connectivity with other P25 systems in the region*
	• *VIDA platform supports EDACS Migration Gateway (EDG), conventional gateways and analog mutual aid channels for complete connectivity to legacy systems*
Future Proof	• *VIDA Core leverages open-standard protocols to provide a flexible, scalable, standards-based infrastructure platform that can be upgraded to integrate new products and technologies as they emerge*
	• *Open-system VIDA architecture accommodate future LTE, broadband data, and video technologies*

Critical Success Factor	How Ci's Design Delivers
	• *Harris MASTRV P25 base stations operate in P25 Phase I and Phase 2 TDMA mode of operation and are easily upgradeable to support 700MHz frequencies.*
Service and Support	• *Ci has a proven record of providing outstanding services for the City of Coral Gables*
	• *Ci has offices, a radio lab, and a fully staffed service facility in the local area for immediate response to system anomalies, routine maintenance and emergency situations*
	• *Ci understands the unique operational needs of coastal public safety organizations through our work with New Orleans, Flagler County, Brevard County, Volusia County, Hillsborough County, Indian River County, Miami Beach, Collier County, Manatee County and SLERS*
Low-Risk	• *Ci's design utilizes existing towers and facilities and radios*
	• *Ci's experience with migrating EDACS systems to P25 and PMP™ certified Project Management staff will ensure the project stays on schedule and on budget*
	• *VIDA's use of Commercial Off The Shelf (COTS) network infrastructure with standard interfaces reduces equipment costs and training time*
	• *EDACS Migration Gateway allows for ease of migration to P25, preventing a "forklift" upgrade to a new system. Allows users to migrate at a financially manageable rate*
	• *Ci's design accommodates existing CONOPS, promoting continuity of service and minimizing need for re-training*

The proposed Harris solution offers the following advantages, which together will benefit the City's end users by improving system reliability, capability, and performance, thereby enhancing overall mission success:

▪ **True Standards Based System –** Incorporation of standards-based P25 and IP systems leads to lower costs. P25 standards allow the City to procure competitively priced P25 radios and allows for reuse of existing radios that are upgradable to P25 mode of operation. IP standards utilize COTS networking components, which allows a smooth migration to future technologies.

▪ **Compliance Assessment Program (CAP) -** Not only a participant in CAP testing, Harris Corporation is a leader in the CAP program. Harris has provided strong leadership and contribution in the key areas of the P25 Phase 2 TDMA air interface, the P25 wireline Inter RF Subsystem Interface (ISSI), P25 trunking and conventional control, and P25 encryption. These contributions have led to efficient and complete standards development and publication of over 15 core standards in these key areas.

o All P25 products in Ci's offering for the City of Coral Gables are CAP certified.

In the following pages we will provide an overview of the solution and our design decisions which created it.

Harris VIDA™ Core Differentiators

After reviewing the city's critical success factors (Value, Interoperability, Future Proof Operation, Support and Service, and Low Risk) and considering the City's legacy systems, geography, logistical challenges, operational footprint, and future needs, *Ci's technical team has selected the Harris VIDA™ Core as the optimal base architecture for the Coral Gables system.*

Leveraging IP technology and open standards, the VIDA platform provides unified interoperable communications for voice, data and applications across a multitude of technologies ranging from land mobile radio narrowband to broadband data networks. Because it supports the co-mingling of technologies to serve the diverse needs of all users operating on the system, VIDA is an integrated communications infrastructure that is scalable, flexible, and easily expanded.

The architecture and key elements of the VIDA system are shown in the illustration below.

Figure 1. VIDA delivers mission critical services over any transport with best in class presentation

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A wireless network based on the VIDA core bridges the gap between legacy systems and current technology, and becomes the foundation for future developments. The VIDA core uses commercial-off-the-shelf equipment which eliminates proprietary hardware, database software, and operating systems. Services in the core are bundled onto a single server, reducing the cost of purchasing, operating, and maintain the hardware. IP technology using data packets increases the redundancy and scalability of the VIDA network.

> **Future Proof:** Ci's solution leverages the Harris 'One Network' standardized infrastructure to accommodate the best communications technologies for each application. Our solutions are naturally "open," with no closed interfaces; this protects the City of Coral Gables against becoming locked in to one vendor or technology over the life of the system.

COTS Equipment

The VIDA core is truly a commercial-off-the-shelf equipment based platform. Harris has teamed with information technology industry leaders to develop a solution which draws upon next generation IT technology and overlays integrated critical communication services to provide the most robust, secure and redundant platform in the LMR market. No proprietary hardware or operating systems are embedded in the VIDA core.

IT Partners

Dell	NetApp
Cisco	Sybase
Red Hat	LogLogic
Microsoft	SourceFire

Virtualized Core

The VIDA solution incorporates the use of virtual machines in the server core. Virtual machines are virtualized servers that support multiple applications, which would typically reside on their own individual servers. The virtualized servers automatically allocate the appropriate processing, memory and networking resources for each application. The virtualized servers within the VIDA core perform all of the mission critical services required, while reducing hardware, increasing efficiency, and making the most out of the resources for the network.

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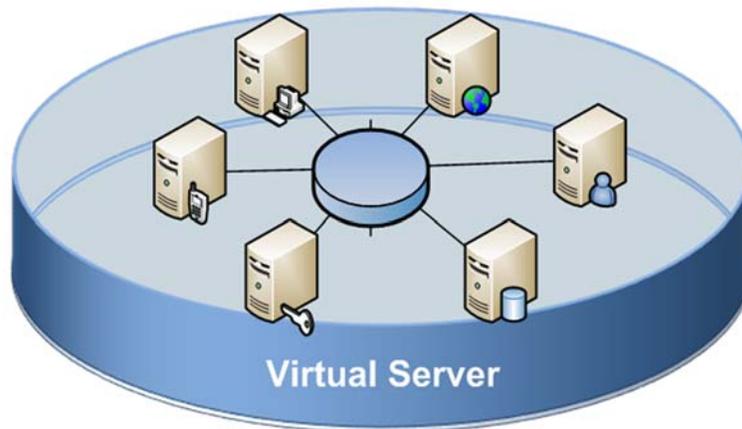
Figure 2. Virtual machines reside on a single server

Virtualization has a number of benefits that serve to reduce total cost of ownership in terms of physical space required for the deployment and the cooling associated with having multiple servers. For a typical deployment, Harris' fully virtualized core will produce 25% of the heat and occupy 25% of the space as compared to traditional server architectures.

> *Service and Support: For a typical deployment, Harris' fully virtualized core will produce 25% of the heat and occupy 25% of the space as compared to traditional server architectures.*

Virtual servers provide the flexibility and control to manage resources more effectively, reduce costly down time, and provide that extra level of system resilience with key services to keep mission critical users operational. Additionally, a virtual server environment has a number of IT-centric benefits that fully support operations expected in an IT environment, including server redundancy, services monitoring, backup/restore capability and installation/upgrade processes.

In every VIDA core, the following services have been bundled into the standard offering:

- Voice Network Controller (VNIC) – Voice packet switching application
- Transcoder – Translates between varying vocoders in the digital domain (ADPCM for legacy systems, full rate AMBE for P25 Phase 1 and BeOn, and half rate AMBE for P25 Phase 2)
- Unified Administration Server (UAS) – System administration and provisioning
- Regional Site Manager (RSM) – Manages control data flow between RF sites and VNIC
- Regional Network Manager (RNM) – Network Alarm management
- Active Directory – Network security (access control and group profiles)
- BeOn Foundation – Interfaces radio systems to commercial 3G and 4G carriers; serves up to 25 clients
- SUMS 2.0 – Network security (patch management)
- E-Policy – Network security (anti-virus management)
- Device Manager – Software updates for infrastructure

Optional features are added to the server as additional virtualized services:

- Inter Subsystem Interface (ISSI) – Interoperability with other Project 25 systems
- VIDA Telephone Interface (VTI) – Interface to PSTN
- Key Mgmt Facility (KMF) – OTAR server
- CiscoWorks – Network security (network & firewall management)
- BeOn (higher tiers) – Increased support up to 5000 clients
- LogLogic SysLog – Network security (system log)
- Unitrends Backup – Network security (disaster recovery backup)
- High Availability Configuration – Application, Hardware, and Location redundancy available

Core Resiliency

A key to the successful operation of any mission critical network lies in maintaining the highest levels of network availability. Harris offers its VIDA solution in an array of redundant configurations to combat manmade and natural disasters. These high-availability options improve network redundancy and reliability across multiple local and geographically separated locations, and they are cost-effective solutions for networks of any size.
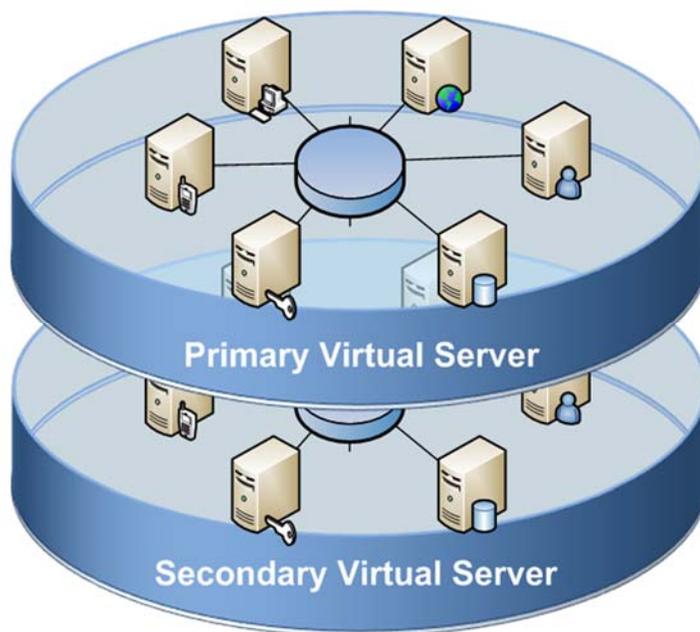
Figure 3. VIDA offers high-availability redundancy

The VIDA solution provides full service high availability failover. Regardless of the services on the primary core, the secondary core takes over all services in failover. ***VIDA provides robust performance without compromise; failover does not mean failure.***

VIDA networks employ the means to meet mission critical reliability, availability, and maintainability requirements, utilizing centralized services that can include geographically split redundant servers. Redundant servers, operating at

distinctly separate geographically and judiciously separated locations (yet fully network interconnected), provide automatic failover capability if a network switch becomes dysfunctional because a server, network, or physical location no longer functions. The optional High-Availability service on the VIDA core ensures expeditious failover of call routing, ensuring that communications continue with minimal impact to users.

Scalability

The VIDA solution provides scalable configurations to meet the needs of every network, from small rural networks that provide local coverage, scaling up to large county and statewide networks that provide wide-area regional coverage and serve a diversity of agencies.

Legacy non-IP radio systems employed circuit-switched technology, meaning that a specific circuit (or path) must be available and established before communications may begin. This resulted in a strict hierarchical architecture that requires physical equipment to provide connectivity between two or more lower level devices as shown below. 0In addition, because the switches were typically based on Versa Module Europa (VME) architecture, the VME bus limited the possible physical expansion.
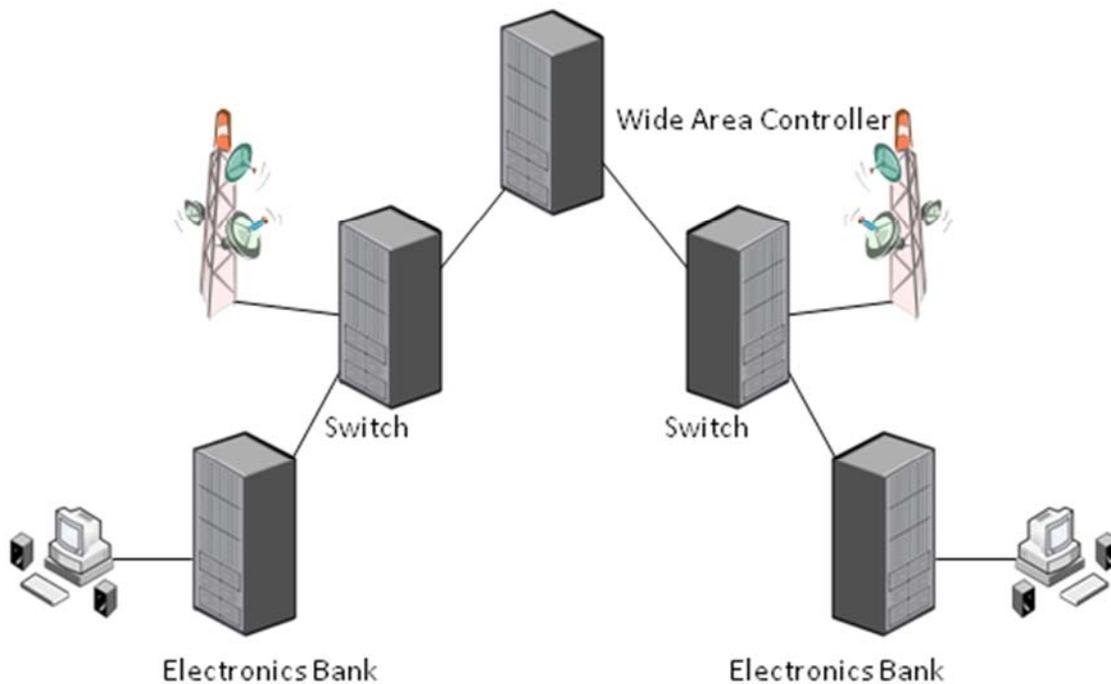
Figure 4. Circuit-Switched Network

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By contrast, digitized voice and data is transmitted through the VIDA network as IP packets, also known as Voice-over- IP (VoIP). VoIP allows the voice to be digitized and stored as packets, then transmitted as capacity is available. This increases the efficiency of the radio system by utilizing available idle communication paths. It also greatly simplifies the duty of proper call routing, allowing this task to be handled by COTS routers and Ethernet switches. One significant advantage of this technology is a flattened architecture which allows virtually unlimited scalability because switches are established as peers, and expansion can be accommodated by simply adding switches.

> *Future Proof: VIDA's™ flattened architecture enables virtually unlimited system scalability because switches are established as peers and expansion can thus be accommodated by simply adding switches.*

Since scalability of the switch is no longer dependent on hard physical limitations, each subsequent server generation includes increased processing power and memory size, automatically expanding switch capacity.
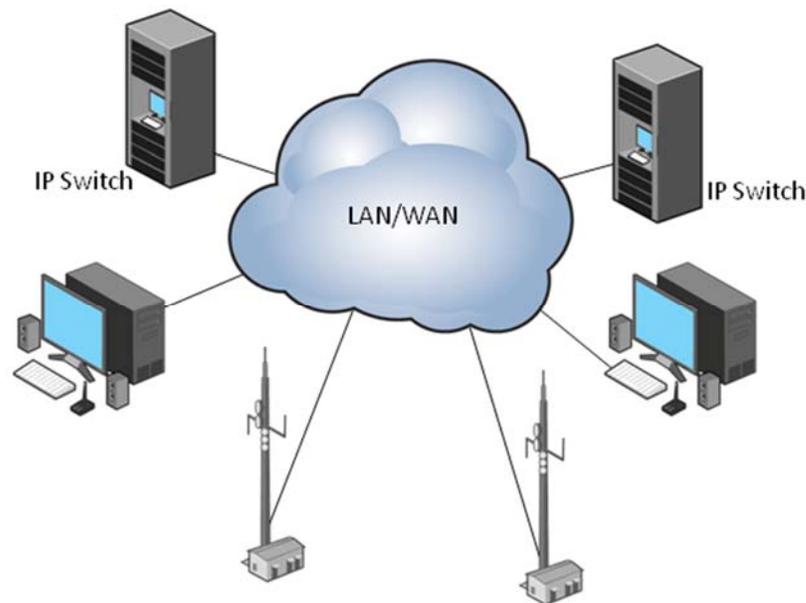
Figure 5. VIDA's IP Network

Harris' 'One Network' standardized design leverages the best communications technologies for each application, and enables our engineering team to incorporate newer technologies and products as they emerge and mature.

Harris' VIDA™ IP packet switching core takes advantage of these technology developments to provide several benefits:

Reliability – one advantage of packet switching is that the network can be configured with multiple paths to each node. If one path fails, the network can automatically route packets around the failed section. This capability translates into reliable communications for public safety professionals.

Efficiency – by compressing voice data and routing it via multiple paths, packet switching enables the most efficient use of voice traffic so that one channel is not consumed by a circuit connection. Several people can talk simultaneously without tying up the channel.

Voice-over-IP (VoIP) and Data – using packets, voice and data information can be routed together on the same network. With IP, both data and voice packets use the same protocol and packet switching for combination on the same channel.

Functionality – because voice and data are carried using the same protocol, both can be transmitted together, allowing not only audio conversation but also exchange of data such as building floor plans or suspect information. As a result, public safety professionals have access to more information and have a better ability to do their jobs.

Our solutions are naturally "open," with no closed interfaces; this protects the City against becoming locked in to one vendor or technology over the life of the system.

Figure 6: The Harris Compliance Assessment Laboratory

- **Inherent Redundancy and Robustness –** Components critical to the functionality of the network have been designed with redundant features to ensure that the failure of one component does not render the communications system inoperable. The proposed design achieves optimum reliability by using a distributed architecture that removes the intelligence from a single component and distributes the intelligence across multiple system elements.

- **Enhanced Coverage –** Each subsystem is designed to meet or exceed the city's requirements for coverage.

- **Bonus System Capacity –** The proposed Harris radio site equipment provides additional system capacity through spectral efficiencies created by Enhanced Dynamic Dual Mode operation and Adaptive Site Resource Allocation, features only available in Harris' VIDA P25 solution.

- **Unmatched Interoperability –** The proposed system includes the Harris Interoperability Gateway to provide interoperability with conventional systems. Additionally, the available ISSI Gateway allows direct, seamless connectivity to neighboring P25 systems.

- **Customer-Proven Scalability –** Each subsystem has been designed and priced as either a base offering or option as requested. The scalability of the network allows the city's P25 system to add different sub-systems when the need arises. The proposed architecture also allows for easy addition of future sites, dispatch positions, or channel expansion.

- **Unique Phase 2 Migration Flexibility –** Harris' VIDA exclusive Enhanced Dynamic Dual Mode functionality enables the City to operate a mixed mode system (P25 Phase 1 and Phase 2) during system migration and to host P25 Phase 1 cooperator radios once migration is completed—in a way that optimally preserves the capacity gains of Phase 2 operation.
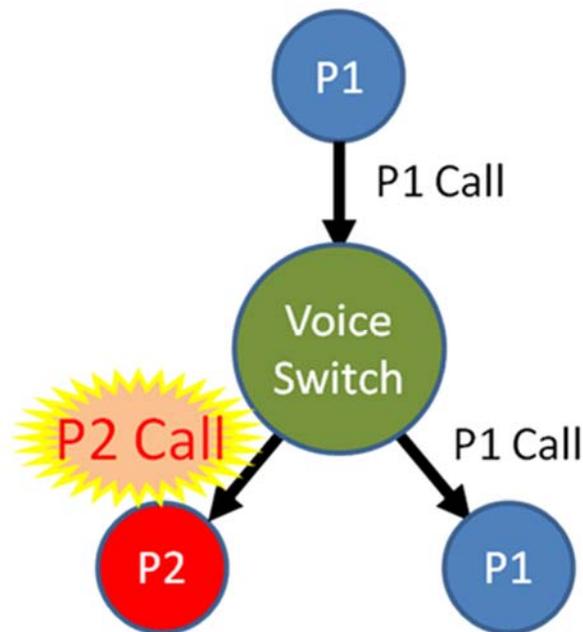
Figure 7: Enhanced Dynamic Dual Mode Operation

- **Investment towards Migration –** The proposed P25 base stations (MASTR V) and the IP Simulcast Control Point are P25 Phase 2 hardware as delivered. This equipment can operate in P25 Phase 1 and Phase 2 TDMA modes of operation simultaneously. The incorporation of COTS equipment allows simple replacement with faster, more powerful hardware when components become obsolete. Additionally, the use of COTS equipment allows the system to migrate easily as new technologies evolve, without requiring expensive forklift upgrades. Ci and Harris' customer support for transitioning to newer generation systems is unmatched in the industry.

Ci's Custom-Crafted Solution for the City of Coral Gables

For Coral Gables, Ci's staff of radio and IT engineering experts have crafted a P25-compliant, 3-site, digital trunked simulcast radio communications solution built on the Harris VIDA P25 network platform—the very first fully IP-based radio communications system with a track record of successfully delivering integrated secure voice and data services in mission critical implementations for over a decade.

The proposed system meets or exceeds all of the city's requirements while leveraging existing radio system sites and facilities to maximize return on investment. The proposed system is custom designed to satisfy all of the city's critical success factors as summarized in Table 1.

In the following pages we will provide an overview of the solution and our design decisions which influenced it. We will discuss the design principles and guidelines and explain the engineering tradeoffs our team considered and show you how our approach provides the City of Coral Gables with the maximum return on investment both now and in the future.

Ci's 800 MHz P25 Phase II Simulcast solution for the City of Coral Gables consists of the following key components as shown in the following figure:

- **VIDA P25 Core:**
  - Hardware Redundant configuration
  - Call Processing Core
  - Network Control and Coordination
    - Network Switching Center for call control and routing
    - Network configuration, administration and management functions
  - System Level Features
    - System redundancy mechanisms
    - Information Assurance, Security, and Encryption
  - Interoperability gateways
  - Regional Network Manager
  - Symphony dispatch consoles
  - EDACS Migration Gateway
- **800 MHz Linear Modulation Simulcast Radio Network**
  - Three 10-Channel P25 Phase II transmit/receive sites
  - Modular upgrade to 700 MHz (no forklift)
  - Geographically redundant P25 IP Control Points
  - New optimized transmit and receive antenna systems

- **Microwave Transport Network**

  o Hot standby Proteus MX™ radios from Microwave Networks, Inc. (MNI)

  o Proven Public Safety Grade Reliability

  o Expandable to meet future growth

  o Native TDM and Ethernet in one comprehensive package for current and future needs

- **EDACS Migration Gateway**

  o Seamless interconnection of existing EDACS system to new P25 system

  o Allows for easier migration path

**City of Coral Gables
High Level System Overview-Harris P25 Radio Network**

Company Proprietary and Confidential
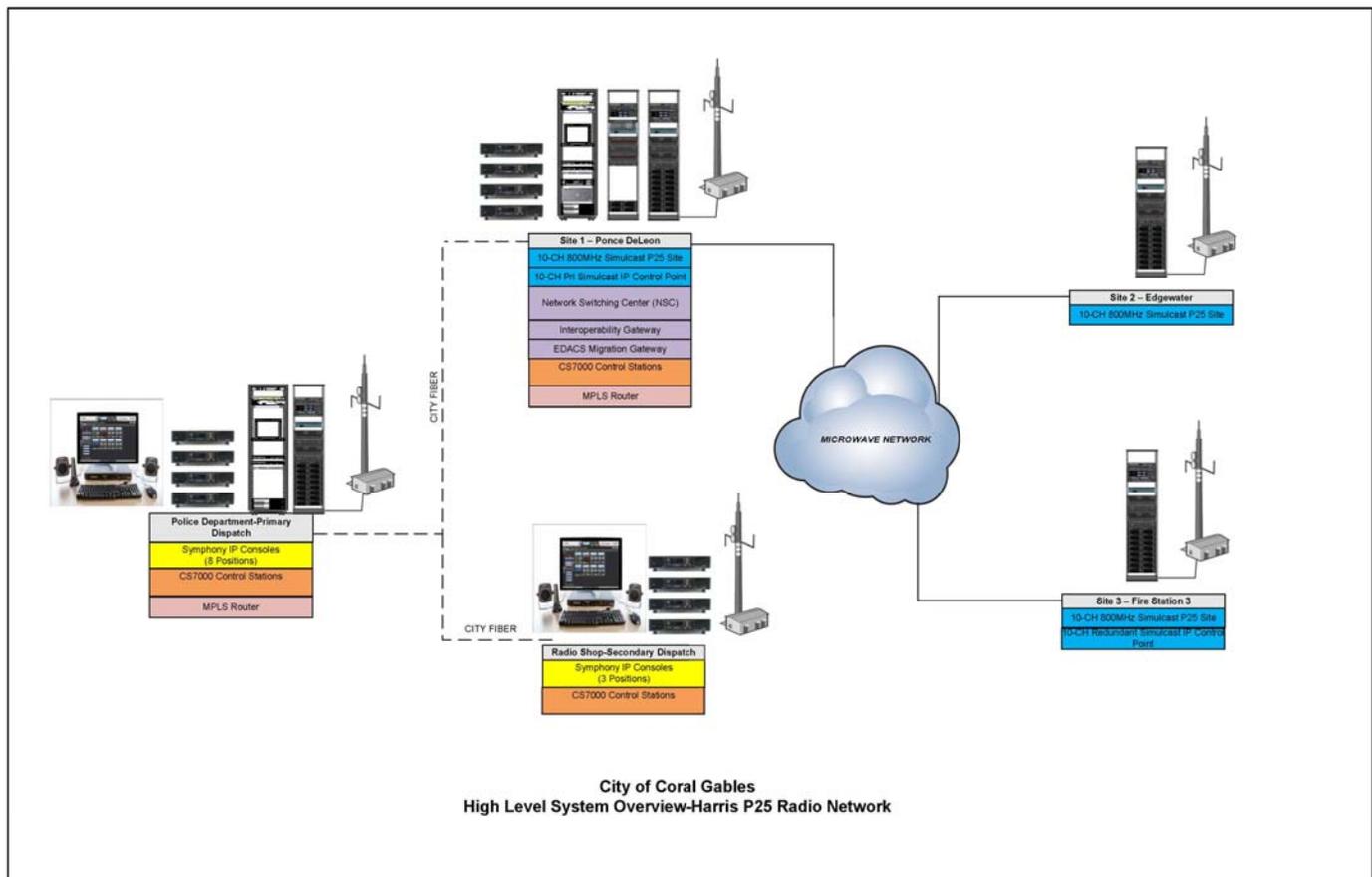
Figure 8: Architecture and key elements of the City of Coral Gables P25 system

Redundancy and Survivability

Ci's extensive experience with the operational needs of the City of Coral Gables, and other public safety agencies, provided first-hand knowledge for the system design and the development of the city's system redundancy requirements:

- **Coverage Backup**: Coverage map verification showing site loss or degradation is backed-up by coverage from adjacent sites.

- All base/repeaters will be configured to provide P25 trunked voice transmissions to user radios. They will be configured as either a P25 control channel or working channel, and any working channel repeater is capable of automatically assuming the role of the control channel in the case of a failure of the control channel repeater.

> *Value: All base/repeaters will be configured to provide P25 trunked voice transmissions to user radios. They will be configured as either a P25 control channel or working channel, and any working channel repeater is capable of automatically assuming the role of the control channel in case the control channel repeater fails.*

- **Fully Distributed IP Simulcast Control Point**: A key differentiator for simulcast from Harris is the Distributed Simulcast Control Point. Geographically distributed, the Distributed IP Control Point provides automatic failover, though the use of N-N control functionality redundancy with distributive control technology. This enables the entire control point, and all related equipment, to fail over to another fully operable control point. Other vendors' simulcast offerings failover a couple components but not the entire control point. Ci has designed Coral Gables' Public Safety Radio System with Distributed IP Simulcast Control Points.
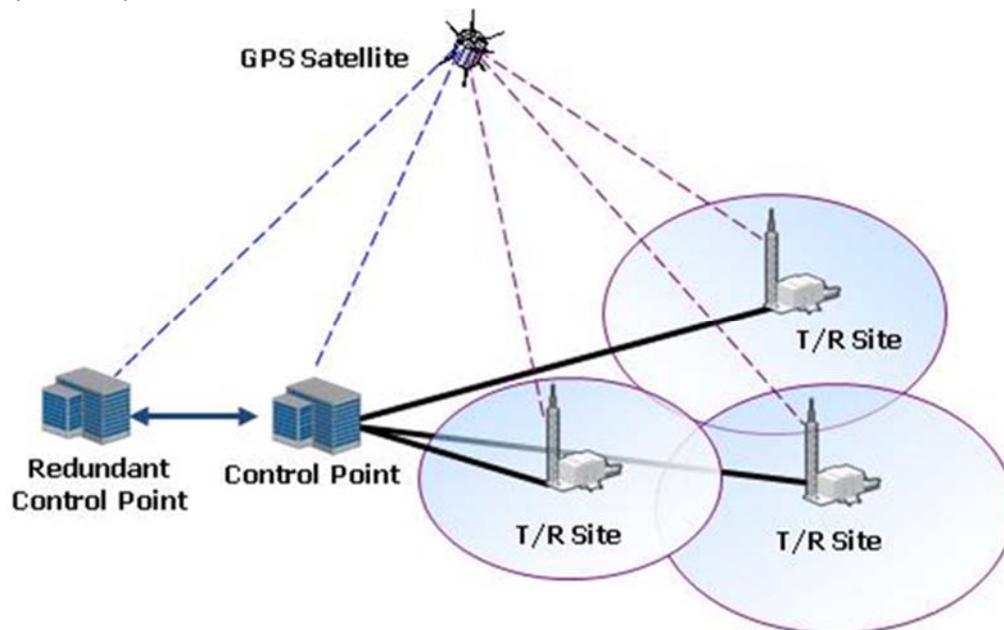
Figure 9: Distributed IP Simulcast Control Point

▪ **Enhanced Failsoft with Security**: Capitalizing on the EDACS simulcast bypass feature, Enhanced Failsoft with Security mode is an operational state when a P25 simulcast system encounters a fault condition. Enhanced Failsoft is an exclusive Harris feature and provides a level of fault tolerance far and above that of systems that fall back to conventional operation in failsoft mode. Specifically, the advantages of Enhanced Failsoft with Security include:

- Avoids failing to conventional operation, eliminating operator confusion and error.
- Maintains a full suite of radio authorization security measures to prevent unauthorized users from accessing the system or talkgroup.
- Continues trunking communication on the standalone simulcast site.
- Defines specific failure mode per site for user/talkgroup security authorization.
- User validation is maintained.

The different types of Enhanced Failsoft modes of operation are as follows:

▪ Automatic Enhanced Failsoft
- Go Dark
- Standalone

Automatic Enhanced Failsoft

When the simulcast system detects a condition warranting Enhanced Failsoft operation, the control point automatically enters Enhanced Failsoft mode and reconfigures the simulcast system accordingly to avoid interference between the site in Enhanced Failsoft and the rest of the simulcast system. Several examples of conditions which generate an Automatic Enhanced Failsoft mode of operation include the following:

▪ Loss of communications from the IP control point to all sites.
▪ Loss of network connectivity between the IP control point and a transmit site.
▪ All active Baseband modules report loss of the 10 MHz reference signal.
▪ All active Baseband modules report loss of 1 PPS from the GPS receivers.
▪ All active Baseband modules report GPS receiver major alarm.

Go Dark

Go Dark is the most commonly used Enhanced Failsoft mode. In this mode, the IP control point continues to use all channels while the site(s) reporting a fault simply goes off the air. Communications in this "dark" site's capture zone is dependent upon 'fill in' coverage from adjacent simulcast sites. The benefit is that all channels and system features, including multisite and console calling, are available for users that can access the remaining sites that are still in operation; however, the coverage area in closest proximity to the dark site may be reduced.

When a simulcast transmit site enters automatic Enhanced Failsoft mode, preprogrammed configuration parameters direct the site to configure for either Go Dark or Standalone Enhanced Failsoft operation. When the fault condition is corrected, the remote site exits Enhanced Failsoft mode and the site returns to normal operation.

Standalone Enhanced Failsoft

During Standalone Enhanced Failsoft mode, the system maintains service to the unaffected transmit sites while attempting to maintain some level of local service within the coverage area of the Enhanced Failsoft site. The benefits of using Standalone Enhanced Failsoft mode of operation include:

- Full territorial coverage with a minimized impact to services
- Reduced interference between the Standalone site and the remaining simulcast system
- Maintain trunked communications and features with users in a Standalone Enhanced Failsoft site's coverage area, eliminating operator confusion and error

In Standalone Enhanced Failsoft mode, several major system changes occur in an attempt to minimize effects on the system's geographic coverage:

- Operational sites continue to simulcast
- Faulty sites continue operation in a single site P25 Trunking Mode

Additional Backup Ideas

As another means of backup, the dispatch centers are equipped with local units to maintain communications with sites operating in Standalone Enhanced Failsoft mode. When a system is in Standalone Enhanced Failsoft mode, the display on Harris radios will use indicator icons to alert a user that a limited mode of operation is use.

- **Hot Standby Microwave Radios**

    o 1+1 Hot Standby protected Proteus MX radios
    o Eliminates all active components which could result in a single point of failure in the signal path
    o Complete protection of all signal and overhead channels
    o Increased Path availability through utilization of Automatic Transmit Power Control (ATPC) and Adaptive Code and Modulation (ACM)

A primary design objective of public safety radio systems is to ensure constant communications in the event of a failure(s). A system that does not operate reliably, or that changes operation dramatically during failure modes, exposes its users to unacceptable risks. The city's radio users must be able to depend on highly reliable and fault tolerant radio communications, regardless of failures caused by equipment malfunction, natural disasters, or man-made catastrophes. In addition, a critical communication system must have the ability to recover quickly. In the case of catastrophic failures, VIDA P25 networks are designed to support a variety of user-configured operation modes to manage system anomalies and preserve critical functionality of the system while repair and recovery measures are enacted.

Coverage

Optimizing System Coverage and Site Selection

Ci's solution meets Coral Gables' coverage expectations and uses existing radio site facilities and towers.

> *Low Risk: Ci's design utilizes existing tower facilities and will not involve any new construction or modifications, reducing schedule and logistical risks.*

Ci's engineering team conducted multiple rigorous propagation scenarios using Harris' Radio Analysis and Propagation Tool Repository (RAPTR) design software. Combined with our experience with the city's current system, local knowledge of the area, and understanding of real-world performance of our radios, RAPTR let us determine the optimal number and configuration of sites and antenna systems to meet or exceed the city's requirements.

RAPTR is an advanced coverage design and engineering software package employing a suite of design modules. This tool enables Harris to manage a system from the initial site selection process, through the detailed coverage design, including microwave backbone design and frequency planning, and finally coverage acceptance. RAPTR makes use of two primary terrain databases: the 30 arc-second database and the 3 arc-second database. The 30 arc-second database is generally available in the public domain, but due to its coarse resolution it is only used where more detailed data is not available. The 3 arc-second database provides much greater resolution and accuracy, both spatially and in elevation. This database is derived from the United States Geological Survey Digital Elevation Model (USGS DEM) data.

> *Value: Ci guarantees that the proposed system, when tested, will achieve all the stated coverage requirements using 3 radio sites.*

The coverage maps, along with tabular and graphic data are provided in this proposal. The tabular and graphic data provide the required parameters and gain/loss calculations used in the preparation of the maps.

Site Locations

The new P25 system leverages existing infrastructure which offer the best value and most coverage for the City. The site locations are as follows, and are illustrated in the System Overview Diagram and coverage maps included with this proposal.

Existing Coral Gables Sites:

- Ponce DeLeon
- Edgewater
- Fire Station 3

Site Equipment

Coral Gables Police Department Dispatch

- One Hardware High Availability Premier Level VIDA Core
    - Two VIDA Application Servers (VASes) hosting the following:
        - Network Switching Service (NSS)
        - Unified Administration System (UAS)
        - Regional Network Manager (RNM)
        - Regional Site Manager (RSM)
        - Active Directory Service (AD)
        - BeOn Service (BeOn)
    - One (1) Interoperability Gateway with forty-eight (48) talkpaths
    - EDACS Migration Gateway with eight (8) talkpaths
    - Licensing for 20 IP Logging Recorder talkpaths
- Alcatel SAR-8 IP/MPLS Router Equipment for Fiber Interface to City's fiber
- Eight (8) Symphony Consoles
- Eight (8) CS7000 Control Stations

Radio Shop Backup Dispatch

- Three (3) Symphony Consoles
- Three (3) CS7000 Control Stations

Ponce DeLeon P25 Radio Site

- Ten (10) 800 MHz MASTR V Stations
- Primary Virtualized Simulcast IP Control Point
- P25 Radio System Antennas
    - Two (2) 800 MHz Transmit Antennas
    - One (1) 800 MHz Receive Antenna
    - One (1) dBSpectra 10-Channel Combiner
    - One (1) dBSpectra Multicoupler and TTA
    - Coax, Cables, and Connectors
- MNI Hot Standby 1+1 Protected Microwave Radio

- o Microwave Eltek DC Plant Equipment and Batteries
- o Antenna System
- o Elliptical Waveguide, Hardware, and Connectors
- o Pressurization Equipment
- Alcatel SAR-8 IP/MPLS Router Equipment for Fiber Interface to City's fiber

Fire Station 3 P25 Radio Site

- Ten (10) 800 MHz MASTR V Stations
- Distributed Redundant Simulcast IP Control Point
- MNI Hot Standby 1+1 Protected Microwave Radio
  - o Microwave Eltek DC Plant Equipment and Batteries
  - o Antenna System
  - o Elliptical Waveguide, Hardware, and Connectors
  - o Pressurization Equipment
- P25 Radio System Antenna System
  - o Two (2) 800 MHz Transmit Antenna
  - o One (1) 800 MHz Receive Antenna
  - o One (1) dBSpectra 10-Channel Combiner
  - o One (1) dBSpectra Multicoupler and TTA
  - o Coax, Cables, and Connectors

Edgewater P25 Radio Site

- Ten (10) 800 MHz MASTR V Stations
- P25 Radio System Antennas
  - o Two (2) 800 MHz Transmit Antennas
  - o One (1) 800 MHz Receive Antenna
  - o One (1) dBSpectra 10-Channel Combiner
  - o One (1) dBSpectra Multicoupler and TTA
  - o Coax, Cables, and Connectors
- MNI Hot Standby 1+1 Protected Microwave Radio
  - o Microwave Eltek DC Plant Equipment and Batteries
  - o Antenna System

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- o   Elliptical Waveguide, Hardware, and Connectors
- o   Pressurization Equipment

System Design Considerations

Spectrum

Ci is proposing the use of the city's existing 800 MHz NPSPAC channels. The exact distribution of channels for the EDACS system and the P25 system will be based upon a loading and usage study using historic City radio usage. These 800 MHz frequencies allow for maximum coverage at the City boundaries. Should the need arise, Ci can provide coordination services with the Regional Planning Committee.

Project 25 Phase 2

P25 Phase 2 does have inherent advantages by nearly doubling the voice talk path capacity of currently deployed P25 Phase I or legacy circuit-switched systems. Although the voice capacity improvement is important, Ci believes the key with Phase 2 operable systems is to provide a graceful migration with maximum interoperability with Phase I and Phase II users on the same system. Another key to migration is maintaining those critical legacy and P25 interfaces to surrounding jurisdictions and agencies. The Harris VIDA P25 Core provides several advantages with which to interface with a variety of other public safety communication systems to both foster interoperability and to extend effective range of the communications networks.

In many cases, customers cannot afford to migrate their legacy system and purchase all new subscriber terminals to operate in Phase II mode at one time. With Harris VIDA P25, customers can migrate at their own pace as budget and timing allow. The following key P25 Phase II features will help the City of Coral Gables optimize their migration and resource utilization:

- ▪   **Enhanced Dynamic Dual Mode** improves the availability of site resources by making use of Phase II to the greatest extent possible for the system. Incoming conventional channels or ISSI (for example) calls are converted to Phase II mode when sent to the sites. The system determines on a site-by-site basis whether radios are able to participate in Phase 2 mode based on radios affiliated with the talkgroup.

- ▪   **Adaptive Site Resource Allocation** allows software control of thresholds that govern Phase I and Phase II operation at the sites. Adaptive Site Resource Allocation can be used to easily change a site's Phase I and Phase II channel resources to accommodate a large number of interoperability first responders that may be arriving in the area, such as in the aftermath of a hurricane.

- ▪   **Distributed IP Simulcast Control Point** allows the entire control point, and all related equipment, to fail over to another fully operable control point. Other vendors' simulcast offerings failover some components, but not the entire control point functionality.

- ▪   Harris P25 Phase II radio systems ensure seamless co-existence of all P25-compliant radios on the Harris system, regardless of the manufacturer or P25 technology (Phase I or Phase II) the radio supports.

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Site Infrastructure

Network Sentry

The Network Sentry allows users to create a flexible work environment tailored to help improve efficiency and productivity. The Network Sentry remote alarm and control unit fault-monitoring services take input from site-alarm sensors, RF power sensors, digital input/output (I/O), and channel test services. The Network Sentry presents alarms to the RNM or other external management systems via SNMP. It identifies in detail the location, severity, and status of faults, alarms, and component failures.

The Network Sentry has an array of digital IOs. These are configurable to indicate faults in devices, such as tower beacons, doors, temperature alarms, etc., that require remote controlling and monitoring. Sent through the network to the RNM, this information allows users to make quick, informed decisions to meet their needs and to adapt as those needs change.

MASTR V Base Station

The MASTR V base station powers secure P25 digital voice and data communications. Its functionality and architecture meet public safety requirements and set it apart from other base stations in the P25 industry:

- Compact and integrated hardware supports up to eight channels in a single cabinet or rack. Multiple RF channels sharing a rack lower costs, minimize the amount of supporting hardware, reduces maintenance, necessary floor space, and the burden on other site resources such as HVAC systems.

- Digital-signal processing routes voice and data calls as IP packets to the network, resulting in economical routing and backhaul.

- The distributed architecture results in high-fault tolerance, minimizing the effects of hardware failure. For example, unlike other vendors' architectures that use a single or redundant site controller computer, each MASTR V base station has a built-in Traffic Controller that controls call-processing functions. An Ethernet switch in the repeater chassis connects each Traffic Controller to two Local Area Networks (LANs) for network management and call processing. This distributed architecture allows all trunking channels to operate as a control or working (voice) channel, which results in a greater level of reliability than that of other systems.

- The flexible hardware platform supports P25 Conventional, P25 Trunked Phase 1 (FDMA), and P25 Trunked Phase 2 (TDMA) operation, reducing migration costs.

- Linear simulcast produces improved audio quality and enhanced coverage compared to legacy simulcast systems.

- The native IP operation simplifies data integration with wireless IP data applications.

- Remote programming of the MASTR V base station allows the system administrator to perform software upgrades, firmware upgrades, or individual parameter changes without traveling to the site and manually connecting to the stations.

- The hardened design allows the MASTR V to operate in rugged environments, with an operating ambient temperature range of -30 °C to +60 °C and to operational altitudes of 15,000 feet above sea level. These base stations currently operate in harsh environments, such as the blazing sands of the Middle East, the frigid extremes of northern Saskatchewan, and the towering peaks of the Sierra Nevada Mountains.

- Modular boards simplify maintenance procedures.

MASTR V Base Station Modules

For P25 operation, it is possible to install the following station modules in the MASTR V base station shelf.

Table 2. MASTR V Base Station Modules

Module	Benefits
Tx Module	- Provides a highly stable RF output to drive the high power amplifier (HPA) module - Uses a Direct Digital Synthesizer (DSS) that optimizes its modulation characteristics. The DSS can digitally create a precision waveform or modulation scheme from a single on-board oscillator
Rx Module	- The MASTR V Rx modules are dual-IF conversion receivers. The receiver uses a sigma-delta-analog-to-digital converter to process the incoming IF signal. The output of this analog-to-digital converter is a complex pair of I/Q baseband digital signals - Supports a wide range of modulation waveforms required for current and next generation public safety two-way radio communications
Baseband Processor Module	- Generates all receive, transmit, and control processing for one or more RF channels - Provides a data interface between the Traffic Controller and the Tx and Rx modules - Generates a heartbeat message to monitor the health of base station modules - Available in 700 MHz, 800 MHz, UHF, and VHF
Traffic Controller Module	- Manages data and control information for one Tx and one Rx channel module. It interprets and directs inbound calls, and issues appropriate control commands to and from the Tx and Rx modules. These include how to handle data between the base station and the control point

Module	Benefits
	▪ Processes decoded radio information received from the baseband processor module and handles all aspects of trunking (e.g., subscriber unit validation, assigned channels, queuing) ▪ Implements P25 call control, network management, and remote channel management. P25 features (e.g., radio registration, authentication, mobility management) are available on a channel-by-channel basis ▪ Encapsulates P25 clear and encrypted voice and data calls into IP packets for routing throughout the network. The packets contain P25 user and talkgroup IDs, allowing the network to operate with seamless end-to-end IP functionality ▪ Handles IP connectivity of each channel with the P25 network. It monitors repeater communications while providing routing for multi-site voice and data calls. The Traffic Controller replicates key P25 database information at the site to allow uninterrupted channel operation ▪ All of the controllers share database and dynamic call processing information from the Network Switching Center (NSC) to avoid having a single point of failure
High Power Amplifier (HPA) Module	▪ Provides continuous duty, solid state, and wideband RF power amplifier ▪ Amplifies the exciter output to the rated station output power level ▪ Equipped with an RF linearizer circuit to improve RF performance. The RF linearizer samples the RF output of the HPA and provides waveform correction to the RF input signal relative to its RF output characteristics. This improves waveform distortion and enhances simulcast operation
Power Supply Module	▪ Provides continuous duty-switching power supply ▪ Includes front-panel LED status indicators for each DC output, an AC Power input LED, and a front-panel on/off switch used to disable the power supply and built-in cooling fan
Ethernet Switch	▪ Enable Ethernet communications to pass voice and data transmissions as well as management and control data between the Traffic Controller and supporting MASTR V modules ▪ Are available on redundant modules

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BeOn

BeOn Group Communications

The BeOn group communications suite was developed to extend traditional Land Mobile Radio (LMR) Push-to-Talk (PTT) communication services to users on commercial cellular and private broadband networks. With BeOn, voice communication services are delivered to subscribers as voice-over-IP data packets using wireless broadband IP data services. Because BeOn abstracts the traditional LMR functionality into a software-based network data service, BeOn can run across a variety of IP-based broadband networks. The two primary deployments of BeOn are on 3G commercial cellular and private public safety LTE networks. Using BeOn, subscribers on a cellular or public safety broadband network can communicate amongst themselves or with interconnected LMR users.

BeOn goes beyond LMR by providing integrated voice, text messaging and location services. Using BeOn, first responders can use the coverage and bandwidth of a broadband data network for instantaneous communication capabilities between team members. In addition to broadband users, BeOn subscribers can seamlessly interoperate with users on existing public safety LMR systems. BeOn users can exchange text messages with other subscribers and dispatchers, and pass real-time location and presence information between connected team members and the dispatcher's CAD system. With BeOn, subscribers improve their ability to respond to both routine and catastrophic events because critical information about the response is both communicated and available. Transmitted voice and text messages are both communicated in real-time, and are available locally on subscriber handset for later recall. When these communications are combined with the integrated mapping and presence (subscriber status) information, first responders can determine the most efficient actions to address incidents.

Because BeOn operates over both commercial cellular and public safety LTE networks, utilizing these networks provides an additional level of redundancy to mission-critical narrowband communications. This extends the network coverage of a regional, statewide, or nationwide network to the global reach of commercial cellular. BeOn subscribers on broadband networks are cost effective to deploy for both mission critical and non-mission critical communications. Subscribers on these networks can quickly be provisioned with a wide range of services, including end-to-end encrypted voice communications.

BeOn Network Overview

The BeOn network infrastructure and client applications fully integrate with Harris LMR and LTE networks, providing enhanced PTT services to users on both commercial and private broadband networks.

BeOn directly integrates broadband group communication services into the LMR and LTE networks. BeOn leverages the proposed VIDA core packet switching services, network management and subscriber administration services with the addition of blade servers which host the BeOn Access Point and Assignment Server applications:

- BeOn Access Point (AP) – The BeOn AP is the primary point of contact for BeOn subscribers interfacing with the NSC. The AP proxies for all BeOn subscribers to the network, mapping the traditional PTT services of the LMR

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network to the BeOn users running the subscriber application. Each BeOn network, depending on loading and topology, needs one or more APs to support subscribers within a given region.

▪ BeOn Assignment Server (AS) – The BeOn Assignment Server (AS) acts as the "home" server for BeOn clients registering onto the system. The AS determines which BeOn AP should serve each unique subscriber, and manages movement of subscribers between APs when system conditions or roaming warrant changes. In most installations, the BeOn AS and the BeOn AP run on separate blades together in the same physical server. Both the BeOn AP and BeOn AS can be deployed in clusters (multiple servers) for both load balancing and redundancy purposes.

**Figure   11.
BeOn**

Network Overview
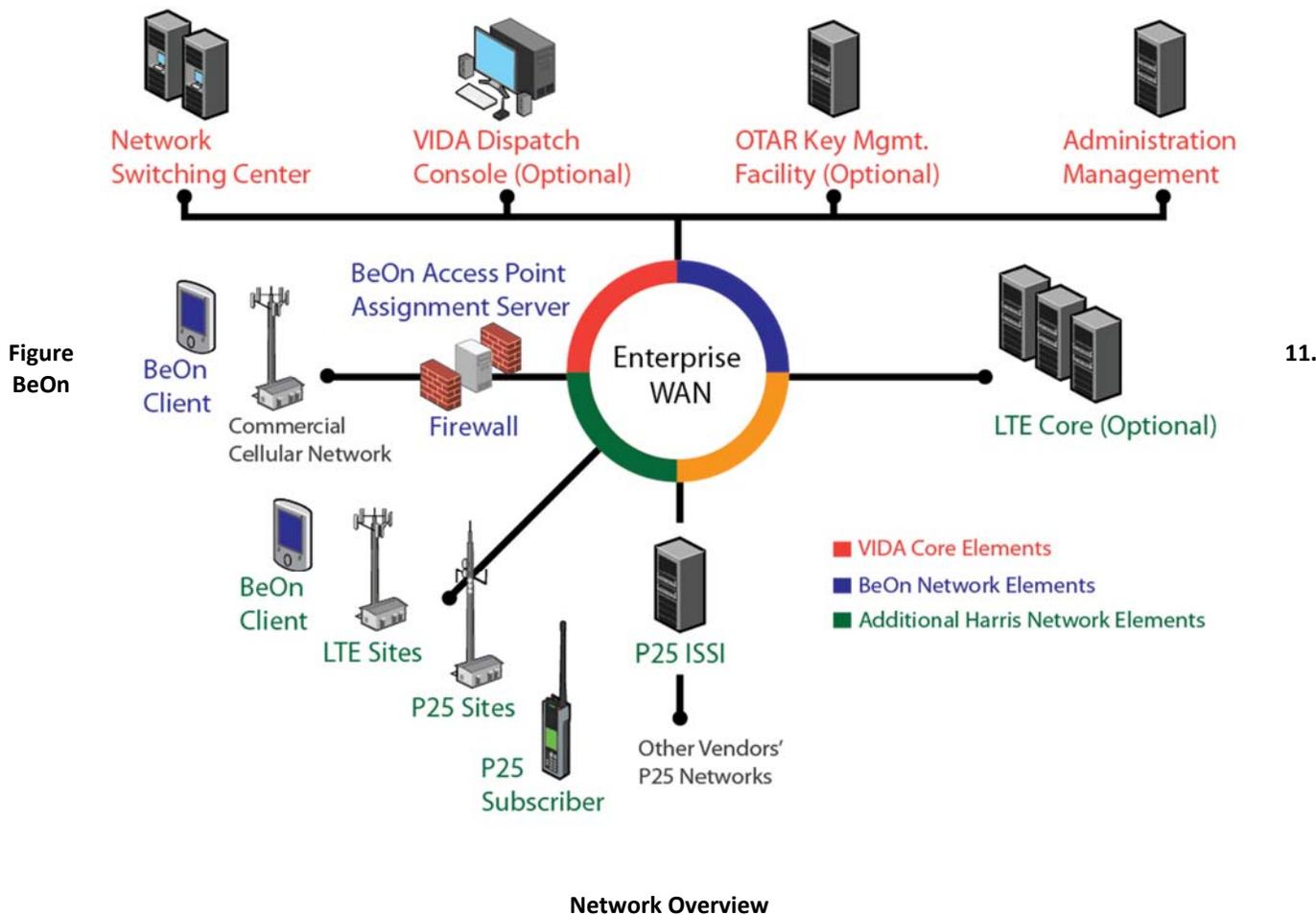
BeOn over Private Broadband Networks

Because BeOn is optimized to operate on 3GPP networks, the solution can also be used to provide LMR voice services over private broadband networks such as the envisioned nationwide public safety 700 MHz LTE network. In the case of a private broadband network, the concept of an APN is generally not required, as the complete network is a "private network" and the wireless network termination point is not needed. In this case, the BeOn infrastructure will be connected to the same network as the LTE core. In the event that the BeOn user agency is separate from the agency that is operating the nationwide private broadband network, the APN concept that is used for commercial carriers can be applied, and the private broadband network can be treated as a high reliability wireless carrier to the agency BeOn traffic.

The BeOn Subscriber Application

The BeOn subscriber application operates on selected Android devices. Because not every Android device is optimized for PTT voice services, Harris engineering has selected the appropriate platforms and, based on performance testing of the BeOn application, has approved the use of BeOn on a range of Android devices. Key requirements for successful integration of the BeOn subscriber application include suitable audio handling (in particular loud, distortion free receive audio propagation and suitable microphone sensitivity), a touch screen display with a minimum 480x600 pixel resolution, and an accessible button on which to map the PTT function. Harris has successfully implemented the BeOn application on both consumer-grade Android devices and hardened Android devices.

The BeOn subscriber application allows the user instant access to voice, presence, mapping and text messaging features on supported Android platforms that vary from consumer grade to fully environmentally hardened.

Figure 12. BeOn Subscriber Application

The BeOn subscriber application allows the user to select an active talkgroup to monitor, or if desired, the user can scan multiple talkgroups. The BeOn subscriber application maps the PTT function to an appropriate hardware button on the subscriber device, allowing users to instantly communicate with their selected talkgroups. Received calls are temporarily stored locally on the device, so a user can replay a missed call or series of calls as required. In addition to group communications, the BeOn user can also communicate directly with individual subscribers by selecting a user from a contacts list or entering a subscriber identification number.

The BeOn application also allows users to declare an emergency or distress condition. Declaring an emergency on the BeOn subscriber devices elevates the priority of the calls throughout the BeOn and connected LMR networks. The BeOn subscriber will also receive the emergency declarations from other users. The emergency status of a talkgroup, user, or recorded transmission is visually denoted on the subscriber display. If desired, specific BeOn subscribers can be configured by the system administrator to act in a supervisory role, clearing emergencies that have been declared by other users.

Going beyond traditional voice services, the BeOn application provides easy access to presence (or status) updates, group member location information, and group text messaging. The BeOn user's presence (available, silent, etc.) and location updates are transmitted to network and made available to other members of the group so that each member of the group is aware of the other users' locations and presence states.

BeOn subscriber Feature Set

BeOn provides a feature-rich user experience, augmenting traditional voice-based PTT services with capabilities enabled by a broadband connection. BeOn allows users with broadband devices to seamlessly interoperate with LMR user, supporting the following P25 voice features.

Table 3. BeOn Subscriber Features

BeOn Voice Feature	Description
Group voice call (clear and encrypted)	BeOn users can initiate and receive group calls with users on both broadband and LMR networks. BeOn users receive the P25 subscriber identifications (SUIDs) from all users, which are mapped in the subscriber device with aliases. BeOn users can participate in both clear and encrypted group calls using P25 AES encryption.
Individual voice call (unacknowledged and acknowledged, clear and encrypted)	BeOn users can initiate and receive individual calls with users on both broadband and LMR networks. BeOn users initiate and receive individual calls using P25 subscriber identifications (SUIDs) or subscriber aliases. Supported modes include both unencrypted and P25 AES encrypted calls. BeOn also supports both P25 unacknowledged and acknowledged individual calls.
Emergency/distress indication	BeOn users can initiate an emergency/distress call on the BeOn subscriber, and will receive emergency indications when other users declare an emergency. BeOn users provisioned with supervisory privileges can clear emergency declarations. Within

BeOn Voice Feature	Description
	the BeOn network and across connected LMR networks, emergency calls have the highest level system priority.
Announcement Group Calls	BeOn talkgroups are associated with a P25 announcement group, allowing dispatchers and other users to communicate with multiple groups simultaneously.
Instant Recall/Call Logging	BeOn subscribers temporarily record incoming and outgoing calls on their device, allowing users to replay missed calls. Calls are recorded in Event Logs, which group transmissions into "conversations" to simplify replay.
Console/Supervisory Override	Console dispatchers and supervisory users can override a call-in-process
Talkgroup Scanning	The BeOn application allows subscribers to scan multiple talkgroups. Each user can select up to 16 talkgroups to monitor. BeOn talkgroup scanning allows the subscriber to designate talkgroups with priority, allowing a higher priority talkgroup call to interrupt a lower priority talkgroup call.
Console Patch/Simulselect	BeOn subscribers can participate in console patched talkgroups, or receive console simulselect calls.
P25 Confirmed Call (with connected LMR network)	BeOn subscribers can initiate P25 confirmed calls, where the network will check to ensure that narrowband LMR members of the talkgroup have access to a working channel before issuing the "talk" beep. With P25 confirmed call, users on the BeOn network will be queued if narrowband working channels are not available to complete the call to LMR users.
Priority/Preemption support	BeOn supports multi-level call prioritization and preemption throughout network. When call volume exceeds capacity (primarily on the narrowband network), BeOn calls will queue or preempt based on network priorities and policies.
P25 OTAR Key Management	BeOn subscribers can be included in OTAR crypto-nets, allowing BeOn subscribers to have encryption keys managed by the network Key Management Facility (KMF). When a crypto-net is rekeyed, the BeOn subscribers are sent new keys using P25 encrypted Key Management Messages from the KMF.

BeOn also provides advanced group communication features that enable situational awareness for BeOn users. These advanced features take advantage of the inherent broadband connection between BeOn devices, and the GPS capabilities of supported smart phones. With BeOn, subscribers automatically exchange location and status information, allowing users to monitor the presence and availability of other group members.

Table 4. BeON Group Communication Features

BeOn Group Communication Feature	Description
Group location	GPS coordinates of group members are automatically exchanged and mapped on the BeOn mapping application.
User presence indication	The icons used by the BeOn subscriber application to display the group members' location also display the members' current status. This combination of location and status is referred to as presence, and it provides BeOn users with a snapshot of situational awareness about the group. Individual subscribers have a choice of multiple status conditions including: ▪ Available ▪ Silent/covert – received audio is recorded to the Event Log but speaker output is muted ▪ Emergency/distress ▪ Unavailable/busy
Location Privacy	A user may disable transmission of location/presence information if required.
BeOn Text Messaging	BeOn users may directly communication with each other using the internal text messaging feature. BeOn text messaging allows the text messages to be included in the Event Log along with recorded audio conversations.

The BeOn User Experience

The BeOn subscriber application fully leverages the capabilities of the Android operating system and uses discrete buttons on the supported hardware platforms. The BeOn subscriber application provides intuitive and distinguishable icons for core functionality, with features driven through use of the Android touch screen. For ease of access, the Push-to-Talk function is mapped to a specific hardware button on each device.

The BeOn Home screen shows the currently selected talkgroup, scan operation, connection status and the user identification of incoming calls. Using the tabbed interface, the user can select the Groups screen to change talk groups, the Contacts screen to communicate individually with other BeOn users, the Events screen to replay missed conversations, and the Scan screen to select and manage scan lists. Other icons on the display provide access to Presence/Status updates and the Location services.

Figure 15. BeOn Subscriber Application

Coverage Maps

Ci's proposed three-site 800 MHz P25 Trunked Simulcast solution provides outstanding mobile and portable coverage for Coral Gables, as illustrated in the coverage maps provided in this proposal. Ci took a conservative approach to the coverage parameters for the sake of reliability and confidence in the coverage results.

Coverage maps are based on predicting the received signal strength at a portable, mobile, or base station receiver in an area adjacent to a companion transmitter. The received signal strength is predicted on the basis of the calculated path loss between a transmitter and receiver, and equipment and system equipment parameters for power, gain, and loss. The Okumura program and the USGS terrain data are used to predict path loss. The Link Budgets provided allow for the City of Coral Gables to fully understand the parameters used in calculating the predictions

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Ci has provided coverage maps in this proposal that show the predicted radio coverage (mobile and portable, indoor and outdoor) of a Phase1 and Phase 2 Harris P25 Simulcast System.

Ci provided both Talk Out and Talk Back coverage plots. All the sites have been designed to be as Talk Out and Talk Back "balanced," as possible. Talk Out refers to a transmission from the site to the user with the radio at the hip level. Talk Back refers to the user radio transmitting to the site with the radio also at the hip level using a shoulder microphone with no antenna. As part of our coverage design planning, Ci "balanced" each site so that whenever the user can receive a signal he/she can also transmit a signal that will make it back to the site.

Backhaul Network

Digital Microwave Network

The digital microwave network for the City of Coral Gables is designed as a three (3) hop hot standby 1+1 network. All paths utilize radios with 45 Mbps capacity.

The digital microwave network consists Proteus MX-Series 6 GHz radios. The Proteus MX-Series boasts virtually limitless interface options while providing the highest flexibility in the industry, allowing for easy expansion of the system in the future. The MX-Series is a medium to high capacity, Native TDM and IP Hybrid, point-to-point microwave radio. Capacity, channel bandwidth and modulation are all software defined in the MX-Series. Physical connections are available for 32 DS1, 4 DS3, OC3 and Gigabit (Electrical or Optical). Each radio terminal comes standard with integrated Gigabit Ethernet (2 switched ports) with VLAN and QoS, and with Rapid Ring Protection (RRP) for loop networks, as required.

Proteus MX Radio

The Proteus MX-Series is one of the most technically advanced, cost effective and flexible native TDM and native IP microwave solutions. Available in several different hardware and path protection configurations including non-protected (1+0 and 2+0), non-protected repeater, fully hot-standby protected (1+1), protected transmit with space diversity receivers and frequency diversity. Key features include:

- Native Ethernet and Native TDM

- Combining IP and TDM networking, Proteus MX offers risk-free migration from DS1 to IP with the highest possible capacities at the lowest overall cost - addressing any deployment scenario.

- 6-350 Mbps per radio carrier (at 6 GHz)

- Capacities up to 2.5 Gbps

- 6-38 GHz licensed frequency

- 2.5-60 MHz channel bandwidth

- TDM: up to 32xDS1.

- Ethernet: 3x10/100/1000Base-T interfaces (FE/GbE), 1xGbE SFP 1000Base-X (Single Mode or Multi Mode), Auxiliary channels, support up to 10K byte Jumbo Frames.

- Integrated L2 Ethernet switch.

- Adaptive Coding & Modulation (ACM)

- Available Encryption: AES 128/256

- MicroBus – Repeater interconnect & traffic aggregation

- DACS – TDM Digital Cross Connection and Grooming

- Available SHARP - T1 Loop Protection

- Highest spectral efficiency

- Forward Error Correction for improved receiver threshold.

- A powerful Transversal Equalizer to provide high tolerance to dispersive fades, and in some configurations, transmit pre-distortion and Trellis Coding for higher overall system gain.

- Network Management: SNMP based element manager software for integration with NMS platforms, for comprehensive network management.

- Reliability: Use of proprietary digital processes, ensuring fiber like quality and tight data security and quality. Path recognition feature that enables only authorized system operation.

- Pay as You Grow- The Pay-as-you-grow model allows you to upgrade your capacity through a license key. There is no need to add new hardware. License keys can be purchased to enable increased capacity or additional features.

Figure 16: Proteus MX Signal Processing Unit

Transmitters

The Transmit output power referenced to the antenna port is 30dBm for a 10MHz channel at 64 QAM, with a capacity of 45Mbps. Bandwidth, modulation, capacity, channel frequency and transmit output power is software adjustable. The Transmitter is both ACM (Adaptive Code Modulation) and ATPC (Automatic transmit power control) capable. The Proteus MX provides errorless switching from main the transmitter to the standby transmitter.

Receivers

The receiver threshold is -78dBm for a 10MHz channel at 64 QAM, with a capacity of 45Mbps. The Dispersive Face Margin is 56 dB.

The Proteus MX features errorless switching between receivers. This feature is required for Space Diversity systems to ensure error free operation when path conditions result in diversity switching. In a Space Diversity system the radio will always switch to the receiver with the better BER.

The errorless receiver switching mechanism is also functional in 1+1 protected radios, although the 10:1 RX power splitter used in the all-indoor radios ensures the radio will normally be operating on the Primary receiver. The radio software prefers the primary receiver and will remain on the primary unless the primary receiver becomes unavailable (alarm or high BER), at which time it will switch errorlessly to the secondary receiver. When the primary receiver returns to proper operation the radio will switch back to the primary to take advantage of the higher system gain.

The radios will be mounted in 7'x19" racks equipped with a Trimm fuse/terminal block panel. The intra-rack DC power wiring will be connected to the Trimm fuse/terminal block panel and the DC circuit for all rack mounted equipment will be separately fused.

At sites with DS1 drops, our proposal also includes Telect DSX-1 cross-connect panels. The cross-connect panels provide monitor and circuit interrupting access points for the testing, monitoring, and patching of the DS1 circuits, and provide an RJ-45 interface for each DS1.

Antenna System

Antennas quoted for all paths are Andrew's PAR Series standard antennas. PAR Series antennas are unshielded, parabolic antennas which meet FCC Part 101, Category A standards and provide rugged, high-quality performance at low initial costs when compared to using High Performance antennas. Radomes and additional antenna stiff-arms are also proposed for all antennas to reduce wind loading and enhance the survivability of the system.

Connection to the antennas is accomplished with Eupen elliptical waveguide. Eupen's pressurized, elliptical waveguide is the preferred choice for many microwave antenna feeder systems because it provides excellent electrical characteristics. The waveguide is precision-formed from high-conductivity copper with a corrugated wall for excellent crush strength. It is lightweight and has good flexibility for ease of handling. Andrew's recommended grounding system will be used on all waveguide runs. Flex waveguide transitions will be used to connect the waveguide to the radio terminal. This provides for ease of transition, improved aesthetics, and vibration and grounding isolation.

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Andrew MT050 Series dehydrators were quoted at all sites for antenna system pressurization. The MT050 Series Automatic Pressurization Dehydrator is designed for reliable pressurization of elliptical waveguide. This compact, fully automatic membrane dehydrator is ideal for reliable pressurization of elliptical waveguide from 0.1 to 20 cu. ft. in volume. MT050 Series dehydrators are fixed pressure units, factory set at 5 lb. /sq. in. Standard features include a built-in storage tank, low pressure alarm, pressure gauge, lighted On/Off switch and resettable circuit breaker.

Alcatel MPLS 7705-SAR IP Routers

The Alcatel Lucent 7705 Service Aggregation Router (SAR-8) has been proposed to interface the Harris P25 Simulcast radio system to the city's fiber transport system. The Alcatel-Lucent 7705 SAR is optimized for multiservice adaptation, aggregation and routing, especially onto a modern Ethernet and IP/MPLS infrastructure.

In order to maintain the critical end-to-end quality of service (QoS) for packet traffic the ALU SAR-8 provides traffic classification and marking based on the following categories:

Classification (Layer 1/Layer 2/Layer 2.5 and/or Layer 3 header):

- Time slot/port
- Ethernet port/VLAN
- ATM service category (CBR/rt-VBR/ nrt-VBR/UBR)
- ATM VC
- Ethernet 802.1p/VLAN
- IP DSCP/MPLS EXP Marking:
- Layer 2 (802.1p)
- Layer 2.5 (EXP) both for tunnel and PWE3
- Layer 3 (DiffServ)

An IP/MPLS network provides a reliable infrastructure to support mission critical voice, video, and data communications. Performance guarantees for critical IP applications such as P25IP and video surveillance are enabled with an IP/MPLS converged network. An IP/MPLS network improves the bandwidth efficiency of a public safety network, saves costs, enables easier access to existing government databases, and enhances the safety of the general public as well as the safety of personnel delivering these services.

Ci's radio network, coupled with the Alcatel MPLS 7705 SAR Routers for the police department fiber span, delivers a highly reliable IP/MPLS capable network solution that will enable the city's public safety agencies to meet the performance requirements of all their mission-critical services and applications. An IP/MPLS implementation offers advantages and savings such as:

- Optimizes the bandwidth available in the network to make possible the introduction of new applications
- Reduces the dependency on leased lines
- Extends services to remote areas
- Satisfies growing IT functions
- Improved interoperability with other agencies, at the local, state and federal levels

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Each router will be equipped with control switch modules and 8-port GE/FE Ethernet cards.

Network Management System (NMS)

Our Microwave Network Management System has been quoted to monitor and control the digital microwave system that Ci is proposing. MNI's NMS provides the following capabilities and features:

- Runs on Windows OS with modest hardware requirements. NMS is a completely open system allowing access to its data from external sources.

- NMS can be used to manage any SNMP enabled device.

- Supports a multi-level hierarchical map. Each hierarchy can represent cities, buildings, or sub-networks. Imported bitmaps of geographic maps or floor plans, along with manual or automatic network placement, lets you create a layout that closely matches the actual network.

- Automatically lay out each map network as a tree, ring, or bus topology. Each map object uses a device specific or user selected icon, and the object colour indicates the device status.

- The Map Navigation Tool Window displays the map as a tree for direct selection of objects. The Navigation tree also displays the current alarm status of each subnet to quickly locate failing devices.

- The map window Full Zoom feature automatically moves and zooms the view so that all devices are always visible in the window. The Pan/Zoom feature lets you select a region to zoom into from the complete set of devices in a view.

- Automatic network discovery agents find new nodes on the network and automatically place them on the root Map. Operators can then move the newly discovered node to any sub-map and configure how NMS will interact with the node.

- Employs distributed polling agent architecture to provide a high performance solution capable of monitoring networks from several hundred devices to tens of thousands. Remote software and Web based consoles provide network information to everyone who needs it.

- Provides remote access consoles through Java or Windows based client software. Each remote user is assigned a security level and unique view of the network based on their user login.

- Security and accountability through support for user audit trails. Any user access to the management platform or configuration changes are tracked and written to a log file. Alerts are automatically generated if an intrusion attempt is detected.

- Alarm events can be configured to automatically Email and or page appropriate service personnel.

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- With the Trend Reporting capability, Polling Agents monitor all user-defined report variables for a learning period and calculate a baseline for typical patterns. Thereafter, the Polling Agents compare the actual polled data to the baseline and generate alarms when variables deviate excessively from the baseline. Polling Agents automatically adjust baselines as traffic patterns change. You can also manually configure alarm thresholds for any polled variable.

- Allows for changing the color of map objects and performs other actions based on received events. Event Action Filters select the action to take when an event occurs.

- Automatically export Map Topology, trend statistics and event log entries to industry standard databases for further processing. Use familiar tools such as Microsoft Access to generate customized trend reports.

- Automatically generates scheduled daily, weekly, and monthly statistical reports. Report formats include graph, bar chart, distribution, and summary. They can be exported to a variety of destinations, including printers, files, or a WEB server.

- User defined custom menus directly perform commands without having to select MIB objects. Custom menus can display a MIB table; edit, graph or chart any set of MIB variables; set an SNMP MIB variable; or run an application program.

MNI's NMS provides the most immediate real-time health indication of the network by the color of the icons representing the sub-networks, sites and individual radios in the network map: each icon's color represents the severity of the most serious problem that the NMS knows of in the radio or radios that that icon represents. The NMS determines the severity level of the radio by polling the radio's mnPrRadStatCurSeverity object, and also by tracking the setting and clearing SNMP traps that the radio can be configured to send to one or more NMS consoles.
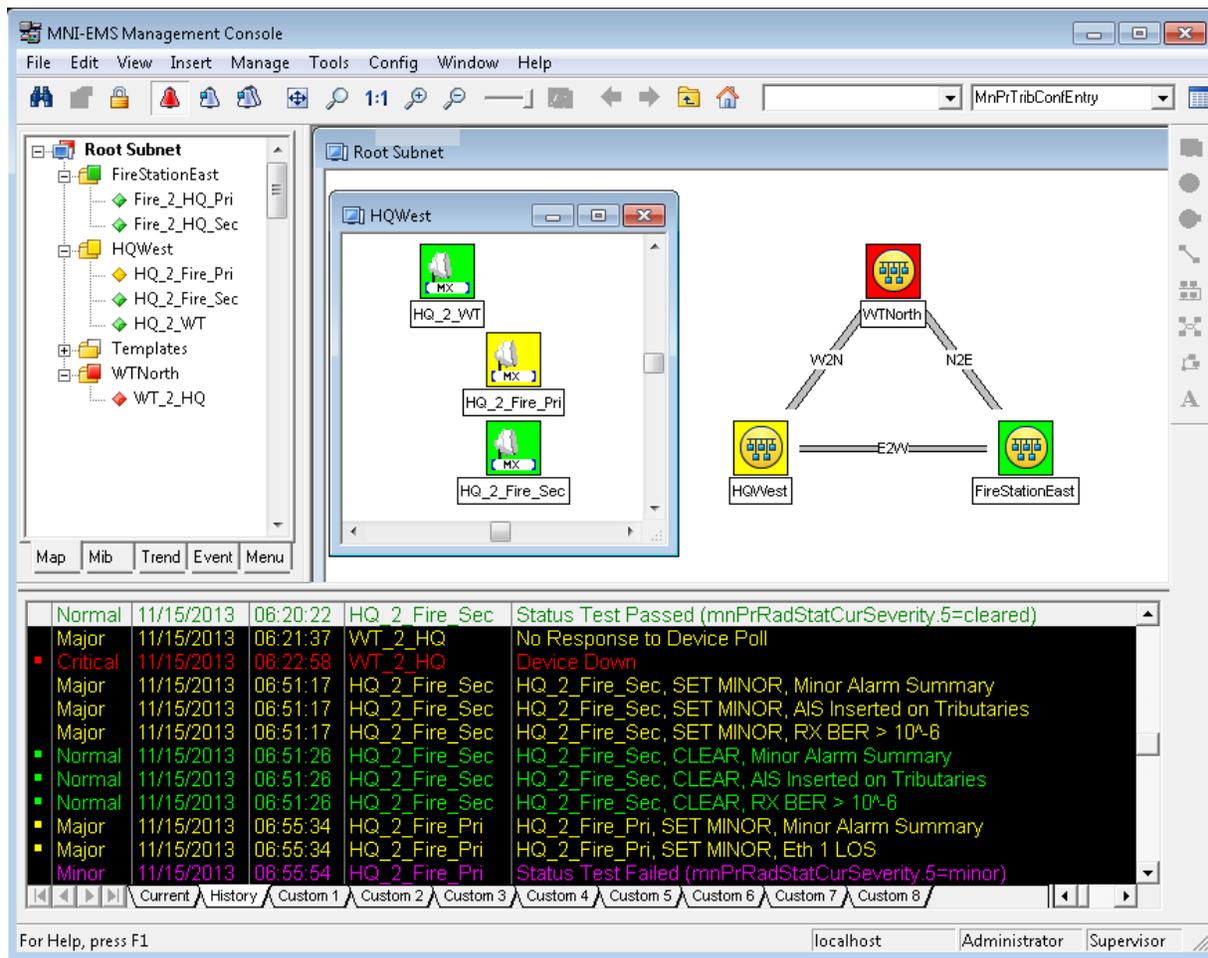
MNI's NMS uses received traps and polling to maintain logs of Active (current) and historical Events (alarms) for the entire network and for each network element.

The Proteus MX radio's MIB contains dozens of status variables, and these can be viewed directly using NMS, or in a more formatted fashion using the Element Manager. In addition, any status variable can be polled by the NMS or NMS script, and the NMS can trigger a notification event if the monitored variable exceeds specified thresholds.

Dispatch Console

General Requirements and Features

Our proposal includes 11 of Harris' flagship, full-featured Symphony™ Dispatch consoles for all radio dispatching functions.

Symphony Dispatch Platform

The Symphony Dispatch Platform is highly configurable to match dispatcher needs. The Solid-State processor operates with the Windows operating system and is specially designed to accommodate the various interfaces used in today's dispatch operations. Standard PC accessories, such as keyboard, mouse and/or trackball, are used as part of the Symphony Dispatch Platform. In addition, the Symphony Dispatch Platform provides automatic gain control of various inputs and simplifies cabling between the Symphony and all possible peripheral options, including:

- Speakers (1/4 - inch TRS jacks) for select and unselect audio

- Microphones (desk or gooseneck style)

- Headsets (six-wire jackbox, wireless, or USB) , including over-the-head and earbud styles

- Foot switches

- Telephone interface via four-wire audio and off-hook contact closure

- Call recorder (select, unselect, and telephone audio)

- External paging encoder

- Backup dispatch control station (four-wire audio/PTT via DB9 connector)

- Six digital inputs

- Five relay outputs

Figure 16. Symphony Dispatch Platform

Physical characteristics of the Symphony Dispatch Platform include:

- 19-inch rack, desktop, or under-desk mount options

- Channel cabling to provide strain relief for rear connectors

- One rack unit (RU) size

- Audio isolation of 50 dB or greater between audio paths

Other important features include:

- Over-drive protection of all external analog inputs

- Buffering of external interface signal lines

- Opto-isolated I/O inputs

- Automatic gain control for mic/line inputs

Microphone

Microphone types available for the console include a headset microphone, a desk microphone, and a boom or a gooseneck microphone. If several microphones are connected to the console (including a microphone within a connected headset), only one is open or active when a PTT initiates at the console. The open microphone used during a console PTT is the connected microphone with the highest priority; all other connected microphones mute.

Foot Pedal

A foot pedal option is available to allow hands-free transmit operation by pressing the foot pedal to initiate a PTT.

Headset Jack

The headset jack accepts six-wire headsets for voice and PTT functionality. Each console position supports a second headset jack to allow real-time monitoring by a trainer or supervisor. The same headset is available to converse on the telephone via a Call Director interface. The headset connects through a hardwired connection or an encrypted cordless adapter; both of which have PTT capability.

Select/Unselect Speakers

High power speakers designed for voice are available with the consoles. In a typical two-speaker configuration, one is designated the select speaker and the other unselect. The select speaker generates the audio from the selected communication module. The unselect speaker reproduces the sum of the audio from all the other modules. The console accommodates up to eight speakers configured as a single select speaker and up to seven unselect speakers. These speakers have controls for volume, bass, and treble as well as an LED that informs the dispatcher when audio is present. This volume control supplements the volume control associated with individual communication modules.

For unselected modules that share a common unselect speaker, changing the speaker's volume setting with the mechanical control changes the audio level of all the summed unselect audio. This is in contrast to module volume

control where volume settings control on an individual module basis. The speaker LED is significant as it alerts the dispatcher when audio is present, even if the volume is low or the console is in a high noise area. This also aids in identifying the active speaker in a multi-speaker configuration.

Symphony Dispatch Console Hardware Specifications

Table 5. Symphony Console Hardware Specifications

Specification	Description
General	
Operating Modes	P25^{IP} Trunking P25^{IP} Digital Conventional OpenSky Conventional Analog EDACSIP Mixed operating modes supported
Symphony Dispatch Platform	Solid state hardware Customized for 24/7 dispatch operation Microsoft® Windows Based
Dispatch Applications Supported	C3 MaestroIP Dispatch Console Symphony Dispatch Console
Display	19" to 48" Flat panel touchscreen
Power Requirement SDP Power Consumption	85–264 VAC, 47-63 Hz 70W
Physical	
Mounting	Desktop, under desk, or rack mounted
Typical Dimensions (HxWxD) in inches	Symphony Dispatch Platform: 1.75 x 16.5 x 11.7 Keyboard: 2x20x9
Environmental Specifications	Operating temperature: +32° F to +104° F Humidity: up to 80% noncondensing RF Interference meets FCC Part 15 and EN55022 for Class A Equipment Electro-magnetic interference meets IEC 801 Parts 2, 3, 4 for ESD, radiated RF immunity, and power line bursts
External Interfaces	
Speakers	One select and up to seven unselect (one standard)
Footswitch	Up to two
Headset	Up to two six-wire jackbox, or two USB

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Specification	Description
	Wired or wireless headsets supported
Microphone	Desktop or gooseneck microphone
Displays	Two Display Ports (up to four monitors)
Network	Two Gigabit Ethernet ports

Both dispatch centers will have a router connecting the site to the integrated communications network. In the unlikely event of a console failure, router failure, or any other failure that will disable a site containing Symphony consoles, this interruption will not affect the remainder of the dispatch system.

Ci proposes the Cisco Layer 3 Switch at the central dispatch locations to allow for the versatility capable with these appliances. There are options available for the network in combination with the dual network interface cards (NIC), that allow for drastic improvements in redundancy and reliability of a dispatch center.

> **Value:** *The Harris Symphony IP based dispatch workstations connect directly to the NSC over IP networking, alleviating the need for dedicated dispatch workstation servers or other back room electronics. Each dispatch workstation can be considered its own server.*

Ci is providing equipment for both the prime E911 Dispatch Center and a secondary E911 Dispatch Center. Both dispatch centers connect to the VIDA Core Switch. All dispatch terminals at the dispatch centers are capable of full dispatching functionality thus providing the City of Coral Gables with multiple 'hot-standby' systems. Dispatch terminals at any other location, if proposed, will have full dispatching capabilities for further redundancy.

Trunked Requirements

The Symphony Dispatch System proposed has access to all the trunked features and functionality described throughout this document.

Conventional Requirements

Harris' Interoperability Gateway permits system level audio connectivity with legacy trunked and conventional analog radio systems, regardless of manufacturer or frequency band. Each source of analog audio connected to the Interoperability Gateway maps to a talkgroup within the radio system. For example, a UHF MED 8 channel that is connected to the Interoperability Gateway is assigned a talkgroup name within the P25 radio system. A system user selects the talkgroup on their radio and can communicate on the MED 8 channel. Analog signals from the MED 8 are encoded by the ADPCM vocoder within the Interoperability Gateway, which operates at 32kbps and results in the highest possible voice quality. The transcoder virtual server translates this higher quality audio message into the P25 over-the-air digital format for P25 radios and BeOn clients and EDACS/ProVoice format for legacy radios. When the talkgroup is selected at

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the Symphony console, the dispatcher also hears all communications on that talkgroup and can communicate with the users on the talkgroup.

Interoperability Gateway

The Interoperability Gateway will provide Coral Gables radio users with voice connectivity to partner agencies operating on separate radio systems. In addition to connecting City users to non-P25 systems in the area, the Interoperability Gateway can also be used during cut-over operations to ensure that critical internal communications are maintained between Coral Gables groups operating on both legacy systems and the new P25 equipment. It is an analog audio interface to legacy radio channels, and systems such as the city's existing conventional systems. Audio on the interface is digitized, compressed, and mapped into P25 talkgroups where it becomes accessible to radio users and dispatchers.

Each interface can connect to an existing system in one of two ways:

- Through a control station set to either the channel or talkgroup for trunking systems
- Through a four-wire connection from a station or console switch on another system

The Interoperability Gateway encodes the audio into IP packets and transfers them over the IP network to the VIDA Core Switch which then determines where to route the packets.

Operator Position Equipment

Please see the dispatch console narrative above for console equipment descriptions for equipment that will be included at each operator position, in addition to the below equipment.

Also at each operator position, Ci will provide and install an M7300 Backup Radio. Each position will include the M7300 Mobile Radio and desk Microphone.

The backup radios for each dispatch center will be combined into a Ci-provided control station combiner and common antenna system.

Common Electronics Equipment

Network Switching Center (NSC)

The VIDA Network Switching Center (NSC) is available in three configurations; Foundation, Premier, and Enterprise. The Premier NSC configuration provides a mid-level sized network switching capability. The Premier NSC utilizes the same technology used in all Harris NSC configurations. Therefore, it upgrades easily to an NSC configuration capable of supporting a larger system when needs dictate expansion of network capacity. The VIDA Premier configuration also supports Hardware High Availability (*proposed*) and Location High Availability (geographically split) options.

The NSC is the heart of any Harris mission-critical communications network. The Premier NSC consists of one main hardware component: the VIDA Applications Server (VAS) that manages the hardware and software components of the networks, routes calls among users, and provides administration of network resources. Interoperability Gateways, devices that interface to analog devices (e.g., legacy radio systems), can be centrally or remotely located for various reasons (e.g., connectivity consolidation).

All of the components in the NSC are Commercial Off-The-Shelf (COTS) computer and networking equipment leveraging the IP industry, thus providing key benefits. This equipment:

- Leverages the continual technological advancements of the computing and networking industry. Each new generation of equipment has more memory, more processing power, and often occupies a smaller physical footprint.

- Spreads the Research and Development (R&D) costs across a much larger customer base. This lowers overall costs to achieve greater technology improvement results, thus reducing total cost of ownership.

- Allows the use of commercially available parts from a wide variety of sources, which ensures competitive pricing.

- Provides scalable hardware to accommodate future growth, protecting the City's initial investment.

In effect, the NSC is a cost-effective means to deploy a scalable radio network as user needs require and budgets dictate. It is easily configurable to accommodate additional sites, talkpaths (channels), and consoles. The design provides the foundation of an IP network to serve the communications needs of users, with the capability to scale up to support regional, statewide, or even nationwide systems.

Ci's solution, as proposed, offers the most cost-effective solution utilizing the above design philosophy, while maintaining the highest-degree of distributed architecture.

Infrastructure Development

General Requirements

Our design consists of three sites.

List of the sites:

1. Ponce DeLeon
2. Edgewater
3. Fire Station 3

Communication Towers

Ci's proposed system design employs the use of existing towers. If required, Ci can provide optional pricing to conduct site and tower analyses. Structural analysis can be performed on existing towers according to the latest TIA-222 standard. Results of the analysis will be provided to the City. If any towers fail the structural analysis, Ci will propose a solution through a change order process.

Shelters

Ci assumes the re-use of the existing equipment shelters.

Generator and Automatic Transfer Switch (ATS)

Ci assumes the re-use of the existing generator sets and ATS.

Site Power

Ci is assuming the re-use of existing electrical and UPS systems at each site.

DC Power

Microwave DC Power Plant: Pricing has been provided for -48 VDC power systems at each site utilizing redundant (N+1) Eltek Flatpack S switch mode rectifiers and Enersys Front Terminal valve regulated lead acid batteries. The Flatpack S system is a compact power system containing a Monitoring and Control Unit (Smartpack), LVD, battery and load circuit breakers. Switch mode technology with soft switching and high switching frequency is used to minimize volume and weight, and to obtain fast output voltage regulation. This rectifier's high efficiency translates into huge, ongoing AC power savings for the life of the system. The Flatpack S charger system will be factory racked, wired and tested assemblies. Rectifiers will be provided in redundant arrangement with units of identical capacity and type working on a load-sharing basis during normal operation. Solid state monitoring by the power board will be continuous and automatic switchover employed in the event of failure of either unit. Upon switchover the surviving rectifier(s) will be able to carry the microwave radio load plus 25% growth and provide a 24 hour recharge of a totally discharged battery bank.

GNB Front Terminal batteries are designed using proven gas recombination technology which removes the need for regular water addition by controlling the evolution of hydrogen and oxygen during charging. This technology provides the user with the freedom to use lead acid batteries in a wide range of applications. The minimal level of gas production allows battery installation in cabinets or on stands, in offices or near main equipment, thus maximizing space utilization and reducing battery accommodation costs. The batteries will be rack mounted in EIA standard relay racks for floor space conservation. The DC distribution circuit breaker panels and the main -48 VDC ground (return) buss will be isolated in this rack as part of the Eltek power board assembly.

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Network Management System

General

Regional Network Manager

The Regional Network Manager (RNM)-a consolidated point for monitoring the health and performance of the P25 network components, provides users with powerful tools that facilitate effective management of a radio system. Managed network objects continuously monitor their performance grade of service. Through active polling of the objects and receipt of autonomous trap information, the RNM keeps the network operators up to date with the latest status of the network. Aided with tools such as the Network Viewer, Object List, Fault Browser, History Browser, and Real- Time Viewer, an RNM user can carry out the task of network management much more efficiently.

Network Management Terminal (NMT)

- **Unified Administration Server (UAS)**: The UAS provides the system administrator a straightforward tool for creating and managing fleet mapping and privileges of the users on the VIDA network.

- **Regional Network Manager (RNM)**: The RNM is a powerful tool that facilitates the effective management of the components of the VIDA network. Through active polling of the objects and receipt of autonomous trap information, the RNM keeps the network operators up-to-date with the latest status of the network. Aided with tools such as a GUI-based user interface, Object List, Fault Browser, History Browser, and Real-Time Viewer, an RNM user can carry out the task of network management much more efficiently. The RNM is collocated at the VIDA Core Switch.

Network Viewer

The Network Viewer provides the operator with a graphical, hierarchical view of the managed network. Each object in the network is represented by a color-coded icon in the view: the color changes when the state of the object changes. Different display modes enable the operator to visually scan the list of managed objects, quickly determine which objects have problems, and identify the types of problems being experienced.

The Network Viewer visually and audibly alerts the operator of performance degradation, traffic congestion, or bottlenecks in the system. This allows the operator to proactively react to degradation trends by initiating corrective actions.

Object List

The most powerful feature of the Object List is the ability to apply many different filtering and masking criteria to the managed objects so that user attention can be quickly focused on the objects of interest. For example, the operator can easily identify those base stations that are reachable but suffer from a major fault, or radio sites that are experiencing busy call traffic.

Fault Browser

The Fault Browser displays fault and status information sent by the managed objects in time-sorted format. The number of faults displayed can be adjusted by applying filters based on object class, object name, arrival time, or sub state severity. The Fault Browser also comes with recommendations for service restoration and fault recovery to assist the operator in handling the incoming alarms.

History Browser

The History Browser provides a historic view of a managed object's operating status in hourly, daily, or weekly format. It allows the user to identify system bottlenecks and hidden defects, derive trend analysis information on certain specific operating characteristics, cross compare objects to study network load distribution, and determine an object's mean time between failure.

Real-Time Viewer

The Real-Time Viewer provides a live view of the voice and data system operation of the network being managed, including subscriber equipment. Detailed performance measurements and the operational status of those managed objects are accessible in real time on an as needed basis.

Subscriber Equipment

Subscriber Equipment

All of Harris' user field equipment includes a rich standard feature group and a la carte software options, depending on the model of the radio.

Physical Features

Great consideration was taken in designing the physical attributes of the radio to ensure ruggedness, simplify operations, and protect your investment.

- *Rugged Chassis* – To meet the demanding requirements of our customers' environments, every radio has been designed to meet and exceed MIL-STD standards for environmental conditions such as wind driven rain, temperature extremes, salt fog, blowing dust, humidity, low pressure, shock, transit drop, and others.

- *Field Programmable, User Definable Software* – Because all radios are software-driven, there are many benefits associated with this capability. First, every radio is field programmable without opening the case. This non-intrusive process saves time and eliminates possibility of damage. The radios' personality PROMs can be programmed with a PC and programming kit. Secondly, the flexibility of the radio software allows users to purchase the exact features required. Because there is no need to purchase unwanted features, you can realize considerable cost savings. Agencies or departments can configure radios to accommodate their individual requirements. Lastly, as communication needs evolve for agencies, a la carte software features can be added to existing radios with simple reprogramming.

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- *Multi-Mode Operation* – All units are capable of both digital trunked and analog conventional operation. Some models are capable of supporting multiple over-the-air protocols, such as P25, OpenSky, and ProVoice/EDACS.

- *Configuration Choices* – Harris offers mobiles with a variety of mounting configurations and control head choices. Similarly, portables are available with a variety of keypad options.

- *Options and Accessories* – Customers have a wide variety of options and accessories to tailor the mobile and portable to meet specific agency needs. A variety of microphones are available for mobiles and portables. In addition, users may choose from a variety of covert operation accessories, carrying cases, batteries, and chargers for their portables. Many mobile and portable accessories are interchangeable across product lines, simplifying maintenance and training.

Operational Features

08 describes the common features that are available in Harris radios. The subsections following will expound on the unique characteristics that differentiate the various models of radios that have been proposed.

Table 6. Operational Features in Harris Radios

Feature	Description
Emergency ID and Alarm	All radios have an emergency alert button. For radios programmed with the emergency feature, activating this button immediately alerts the other members of the unit's talkgroup and the dispatcher of an urgent situation and forwards the unit ID. The resource is then reserved for the emergency response team until reset by a dispatcher or supervisor. This assures an available resource for personnel assigned to the critical situation. All affected units are immediately assigned to the dedicated resource for the duration of the emergency or until cleared by a supervisor.
Unit ID Display	The ID of the calling party is displayed in every receiving unit of his talkgroup during a group call, assuring identification of the caller. In addition, the ID transmitted to the system with each PTT in trunked operation. This assures an accurate record of message transactions for analyzing system traffic reports or reconstructing an incident under investigation.
Special Call	All units are capable of placing preprogrammed Special Calls. These calls may be Individual private calls from one unit directly to another excluding all other units, or Telephone Interconnect Calls.
Repeater Talk-Around	All units are capable of operation in simplex, repeater talk-around mode to communicate radio to radio when out of system repeater range or conducting a special detail intentionally isolated from the trunked system.
Group Scan	The radio monitors the control information and responds to all group assignments associated with the user-programmable "scan" list. This enables field users to monitor other group activity that may affect their mission.

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Feature	Description
Transmit Lockout	This essential feature assures communication once the initiating unit is assigned a resource. Other users in the talk-group are precluded from interrupting (or "stepping on") the transmitting unit, assuring critical messages get through. This prevents a higher-powered mobile unit from overriding a lower powered portable and forces discipline during stressful situations.
System Failure Indicators	Display flags provide indications of system failures to enable key field personnel to diagnose system malfunctions and provide appropriate direction to group personnel.
Prompt Tone	Notifies caller that communication may proceed on the assigned available resource.
Late Entry	Prevents missed calls. A call "late enters" when the original control message was missed.
Convert to Callee	Ensures that only one resource is assigned to a group and that only one person can call when two or more group members simultaneously PTT. The other calls are placed in "receive" mode on the resource assigned to the first caller.
Time-out Timer	A programmable timer will inhibit the transmitter when RF transmission exceeds a predetermined length of time.
Disable/Enable	All radios can be remotely disabled, so that the radio can no longer transmit or receive. Sensitive communications are protected in the event of a stolen or lost radio. In the event that the radio is recovered, it can then be remotely enabled, without need of reprogramming at the shop.
Data	Most mobile radios are equipped with an internal modem to support data communications. All that is required is a data cable to connect the radio to the data device.
Over the Air Programming (Option)	Changes to a radio's specific personality, such as talkgroup affiliation, priorities, access to system features, etc., are transmitted over the air to the radio.
Encryption (Option)	Encryption based on Digital Encryption Standard (DES) or Advanced Encryption Standard (AES) algorithms protect sensitive communications from eavesdroppers.
APCO Project 25 Interoperability	P25 radios are Project 25 compliant for Common Air Interface (CAI) interoperability with other Project 25 users in the conventional talkaround mode. This makes the radio ideal for use either as a primary P25 digital conventional radio or as a trunked radio with talkaround interoperability.

Portables

XG-25P

The XG-25P is the economical solution for those who seek out the best in radio value. Integrating impressive performance with durable construction, the XG-25P supports a wide range of applications and user requirements. Ergonomic controls, an enhanced clarity LCD, software-based design, Bluetooth capability for accessory support, and a full complement of audio accessories make the XG-25P an excellent solution for critical communications users. The XG-25P is available with menu buttons or full keypad. Users can access different preprogrammed radio functions by using the menu buttons.

The XG-25P delivers exceptional audio. The enlarged speaker chamber provides extremely powerful audio, performing up to 3 watts. The XG-25P is one of the lightest radios available, weighing 15 ounces with the lithium ion battery. In addition, the body of the radio is 5.89 inches tall and 2.44 inches wide, making the XG-25P one of the more comfortable radios in the market to carry.

The XG-25P delivers Bluetooth functionality for a wireless interface to selected accessories. Bluetooth provides freedom of movement with no protruding parts or cumbersome wires or cables. In addition, the radio can interface to a Bluetooth-equipped computer, allowing radio programming and configuration without cables.

XG-75

The XG-75 portable provides reliable communications with a range of features designed to excel in challenging public safety, utility, transportation, and industrial environments. Ergonomic controls, an enhanced clarity Liquid Crystal Display (LCD), software-based design, and a full complement of audio accessories make the XG-75 an excellent solution for critical communications users. High-quality voice coding, noise canceling, and robust audio components ensure speech clarity, even in noisy environments. The XG-75 is available with menu buttons or full keypad. Users can access different preprogrammed radio functions by using the menu buttons.

Through high-quality voice coding and robust audio components, the XG-75 provides the loud and clear audio that critical communication users require. The enlarged speaker chamber provides extremely powerful audio, performing up to 3.8 watts. Through multiple audio sources and advanced digital signal processing, the XG-75 utilizes active noise cancellation so transmission of intelligible voice communications is possible in high-noise environments.

The radio records every call received in internal memory, overwriting the last recorded call. When the PLAYBACK button is pressed, the last recording is stored and replayed. Pressing and holding the PLAYBACK button until the tone sounds erases the recording and starts the recording of incoming calls again.

The XG-75 is a light, compact radio, weighing 15.9 ounces with the 16-hour Li-poly battery. In addition, the body of the radio is 5.89 inches tall and 2.44 inches wide, making the XG-75 one of the most comfortable radios in the market to carry, particularly for first responders already laden with multiple items on their belts or bodies.

Unity XG-100P (Option)

The Unity XG-100P full-spectrum portable radio covers the VHF, UHF, and 700/800 MHz frequency bands in a single radio. This interoperable solution can support P25 Trunking, P25 Conventional, and analog FM modes of operation. The ability to scan continuously across all bands, voice modes, and encryption types puts matchless connectivity in the mobile environment. The standard lithium polymer (Li-poly) battery ensures service through a 12-hour shift. Manufactured in the U.S, the Unity XG-100P radio carries a standard three -year warranty.

The Unity XG-100P covers all LMR frequency bands in a single radio:

- VHF high band (136–174 MHz)
- UHF bands (380–520 MHz)
- 700/800 MHz bands (762–870 MHz)

The Unity XG-100P can store up to 10 personalities/mission plans, each supporting 1,250 channels/groups. This configuration ensures sufficient capacity to support multiple interoperability situations.

The features of the Unity XG-100P intuitive user interface result in a capable, easy-to-use radio.

The large, full-color display allows easy use of the radio's features, including text messaging, GPS, and front panel programming. Based on transflective LCD technology, the display uses ambient light to enhance readability. This display enables reading in sunlight and lighted indoor environments with no need to use the backlight, further extending battery life. In dark environments, such as at night, the user can adjust the backlight so the display is completely readable in any situation.

In addition to the full-color front display, the Unity XG-100P includes a top display, which is configurable so that a user read it while the radio is secured in a holster or on the belt, or during handheld operation.

Through multiple audio sources and advanced digital signal processing, the Unity XG-100 utilizes active noise cancellation so transmission of intelligible voice communications is possible in high-noise environments.

The Unity XG-100P incorporates a built-in secure Bluetooth capability that can support wireless audio devices and data connections. For example, the radio can operate not only with a Bluetooth speaker microphone but it can also interface to a Bluetooth equipped computer, allowing programming and configuration without cables. For security purposes, the radio interface controls pairing management and AES encryption ensures security. The Bluetooth transceiver can be disabled, if desired.

Mobiles

XG-25M

The XG-25M is a compact, economical mobile that offers a larger control unit with an easy-to-read display and large buttons for easy operation. The XG-25M integrates impressive performance with durable construction to support a wide range of applications and user requirements. Ergonomic controls, an enhanced clarity LCD, software-based design, and Bluetooth capability for accessory support make the XG-25M an excellent solution for critical communications users. The compact XG-25M is available in either front mount or rear mount configuration with a high-performance internal speaker. The sturdy, compact mechanical package provides high performance and reliable service.

From the oversized display to the large easy-to-read buttons, each feature of the radio provides a better user experience. Simple controls allow users to communicate seamlessly and effectively in a range of surroundings. Since the XG-25M is easy to operate, users can focus attention on the task rather than on radio operation.

The XG-25M delivers Bluetooth functionality for a wireless interface to selected accessories. Bluetooth provides users the flexibility to operate without the use of corded microphones or programming cables if desired.

XG-75M

The XG-75M mobile is a single-band radio available in VHF, UHF, or 700/800 MHz frequency bands. The mobile provides secure interoperations for first responders who need to utilize various operating modes in the public safety environment, enabling seamless communications for multiple communications protocols. Equipped with the CH-721 control head, these units are available with an external speaker in either front (dash) or rear (trunk) mount configurations. The CH-721 control head is available with menu buttons or full keypad. Users can access different preprogrammed radio functions by using the menu buttons.

Figure 19. XG-75M Front Mount with Menu Buttons (left), Rear Mount with Full Keypad (center), and Handheld Controller (right)

The XG-75M series includes the TIA-approved, P25 dual-rate vocoder. The improved dual-rate vocoder software enhances the quality and clarity of vocal communication for public safety radio users in high-noise environments. It effectively differentiates between speech and background noise.

The large graphical display maximizes readability, with its controls designed for ease of use. The photo sensor sets the display to accommodate ambient lighting. In addition, the vacuum fluorescent display improves visibility and readability in all lighting conditions compared to those of other technologies. Combined with the display, the radio's large buttons, volume knob, and channel knob provide an overall user-friendly interface.

The XG-75M is configurable with an optional GPS receiver. This enables secure sending of the user position over the air for position tracking and rapid response for emergencies.

Unity XG-100M

The Unity XG-100M full-spectrum mobile radio covers the VHF, UHF, and 700/800 MHz frequency bands in a single radio. The Unity XG-100M is an interoperable solution capable of supporting P25 Phase1 (FDMA) and Phase 2(TDMA) Trunking, P25 Conventional, and analog FM modes of operation. The ability to scan continuously across all bands, voice modes, and encryption types puts matchless connectivity in the mobile environment.

The Unity XG-100M takes advantage of the technological advances made with the Unity XG-100P portable radio while building on the XG-75M radio platform's proven performance and reliability. These units are available in both front (dash) mount and rear (trunk) mount configurations with an external speaker. Cited as a "Hot Product" by *APCO's Public Safety Communications Magazine*, the Unity XG-100M radio is manufactured in the U.S.

Figure 20. Unity XG-100M with CH-100 Control Head

Built on Harris' experience and expertise, the Unity XG-100M features true software-defined radio architecture that allows flexibility for future growth. The radio supports P25 Phase 1 (FDMA) and Phase 2 (TDMA) standards. In addition, the Unity XG-100M uniquely provides the ability to scale the radio's frequency band coverage that results in life cycle cost advantages to the customer. For example, the radio is configurable for VHF high band and 700/800 MHz coverage. As needs dictate in the future, operation in the UHF band can be added with a software-only change to the radio or operation in VHF low band with a software change and an external amplifier.

The Unity XG-100M equipped with the CH-100 control head allows easy use of the radio's advanced features, including text messaging, GPS, and front-panel programming. The control head features a large, 4x3-inch touchscreen full-color sunlight-readable liquid crystal display (LCD). The user interface takes advantage of resistive touch control on the display, enabling a completely software-driven graphical user interface while maintaining hard control interfaces for channel select, volume control, and emergency calls.

With the CH-100 control unit, the Unity XG-100M features Harris' proprietary noise cancellation capability to provide clear, crisp voice quality in high-noise environments for use in any mode. The CH-100's built-in microphone and advanced signal processing technology, when combined with the hand-held microphone, provide built-in noise cancellation.

CS7000 Desktop Station

The CS7000 desktop control station is configurable with a Unity XG-100M, or XG-75M mobile radio. It provides a convenient method to equip offices, radio shops, and other remote locations with radio communications. The mobile for the CS7000 provides a fixed audio level to the remote interface unaffected by the front volume control. Either a standard mobile microphone or a desktop microphone attaches to the front panel. A USB port and RS-232 serial connectors on the back panel allow external connections (e.g., auxiliary audio inputs, external PTT, etc.) to the desktop station. Both local control only and local/remote control configurations are available for every mobile radio model.

Figure 21. Desktop Control Station with Local Control and Menu Buttons

Figure 22. Desktop Control Station with Local or Remote Control and Full Keypad

The CS7000 desktop control station includes the TIA-approved P25 dual-rate vocoder. The improved dual-rate vocoder software enhances the quality and clarity of vocal communication for public safety radio users in high-noise environments. It effectively differentiates between speech and background noise.

A local/remote control CS7000 control station is equipped with industry standard RJ-11 LINE input connector, standard CAN interface, and RJ-45 Ethernet Local Area Network (LAN) jacks to support multiple connectivity options.

The large graphical display maximizes readability, with its controls designed for ease of use. The photo sensor sets the display to accommodate ambient lighting. Backlighting helps maintain visibility in low-light environments. Combined with the display, the radio's large buttons, volume knob, and channel knob provide an overall user-friendly interface.

System Design Summary

Ci is a true partner with extremely satisfied public safety customers. This level of excellence is earned by designing and implementing systems based on specific customer needs and not generic, cookie cutter efforts. Ci's system design for Coral Gables is based on meeting or exceeding all requirements specified in the city's requirements, and it also focuses on a design that maximizes coverage and minimizes the need for excessive equipment purchases. The City receives the benefit of a system designed for their needs while controlling long-term operations and maintenance costs.

Ci desires to provide the City of Coral Gables with a state-of-the-art radio system while providing cost-effective options for future expansion and upgrades. The City wants a system ready to accommodate new technologies and needs

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changes in system designs and requirements. Based on this understanding, Ci's current design for the City uses the P25 Phase 2 delay spread and Bit Error Rate (BER) parameters. Thus, the city's designed simulcast system has more stringent values providing the confidence that their system will not have the issues with coverage gaps or interference zones (TDI) popping up when utilizing the system in Phase 2 operation.

Ci offers the City a feature-rich system based on the best equipment available today. The City receives the benefit of maximum COTS (Commercial Off-The-Shelf) equipment without getting locked by proprietary requirements. Additional system design considerations provided to the City include:

- Guaranteed 95% portable outdoor coverage from three P25 simulcast sites
- A reliable, fault tolerant and future-ready network
- The Harris Voice, Interoperability, Data and Access (VIDA) Core:
  - Powers your P25 network to support next generation functionality like push to talk and talk group monitoring on cellular and public safety 700 MHz, 4G LTE and 3G cellular networks.
  - P25 (ISSI) inter-sub-system-interface can be added at a later date for more integrated roaming and interoperability with state-wide and neighboring P25 networks.
  - Overcomes the interoperability issues that have plagued multi-discipline, multi-jurisdictional emergency response efforts.
- Cost effectiveness – with the ability to add applications and system capacity as needed, plus the benefit of utilizing shared regional resources, the road forward looks much better with a truly future-proof investment that grows as your needs grow.
- The site design is based on maximum coverage, maximum performance, and cost savings to the City.
- Continuity of Operations – the Ci system solution is flexible enough to support existing City operations and dispatch right down to the user interface-which means less training and more doing.
- Improved mission success – new features, improved radio coverage and unmatched interoperability options translate into increased safety for officers and citizens.
- Additional redundancy above the redundant features already engineered into the Harris system. These include:
  - Hardware High Availability Network Switching Center
  - Redundant Routing and Network Connectivity
  - RF Coverage Overlap
  - Antenna System Fault Tolerance
  - Load-Distributed MASTR V Ethernet Connections
  - Backup dispatch control stations
  - MNI 1+1 Hot standby Microwave Radios on every hop

COVERAGE MAPS

COVERAGE PARAMETERS

SYSTEM PARAMETERS

PARAMETER	VALUE
Propagation Model	Harris Okumura
Project Sensitivity	-105 dBm
Delivered Audio Quality	DAQ 3.4
Area Coverage / Reliability	95%/95% Area Indoor
Design	Bounded Area
Mode of Operation	P25 Linear Simulcast

MOBILE PARAMETERS

PARAMETER	VALUE
Terminal Antenna Height	3 Feet
Transmit Power	44 dBm
Receiver Sensitivity	-110 dBm
Antenna Gain	0.0 dB
Miscellaneous Loss	2.0 dB
Antenna Placement	Center of Roof

PORTABLE PARAMETERS

PARAMETER	VALUE
Terminal Antenna Height	3 Feet
Transmit Power	34.8 dBm
Receiver Sensitivity	-110 dBm
Antenna Gain	0 dB
Body Loss	12.0 dB
Antenna Placement	Hip

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COVERAGE PARAMETERS

SITE NAME	LAT/LON	SITE ELEVATION	TX ANT HT (ft)	TX HAAT (ft)	ERP (dBm)	ANT MODEL	ANT GAIN (dBd)	DOWNTILT	AZIMUTH	TX PWR (dBm)	COMBINER LOSS (Db)	TRANSMISSION LINE LOSS (Db)
PONCE DE LEON BANK	25.74586 -80.2591	7	TX: 225 RX: 225	TX: 229 RX: 229	42.0	DS7A06F36U6N DS7A06F36U6N	4.2 4.2	6° 6°	0 0	44	4.5	1.7
EDGEWATER	25.70654 -80.2527	0	TX: 236 RX: 236	TX: 233 RX: 233	43.5	DS7A06F36U6N DS7A06F36U6N	4.2 4.2	6° 6°	0 0	45.5	4.5	1.7
FIRE STATION 3	25.66321 -80.2822	7	TX: 154 RX: 154	TX: 158 RX: 158	51.7	BMR10-H-B1 BMR10-H-B1	13.1 13.1	0 0	5 5	45.5	4.5	2.4

ENVIRONMENT PARAMETERS

ENVIRONMENT	CATEGORY	ENVIRONMENT LOSS
Water	Lakes	0 dB
Snow & Ice	Snow Pack	0 dB
Wetland	Non-forested	3 dB
Open Land	Bare Land	5 dB
Range Land	Herbaceous	3-7 dB
Transportation	Roadways	5 dB
Agricultural	Grassland	7 dB
Residential	Suburban	12 dB
Forest	Pine (>30')	15-21 dB
Mixed Urban/Buildings	Apartments (<4 stories)	15 dB
Commercial/Industrial	Commercial Services	19 dB
High Density Urban	Skyscrapers	28 dB

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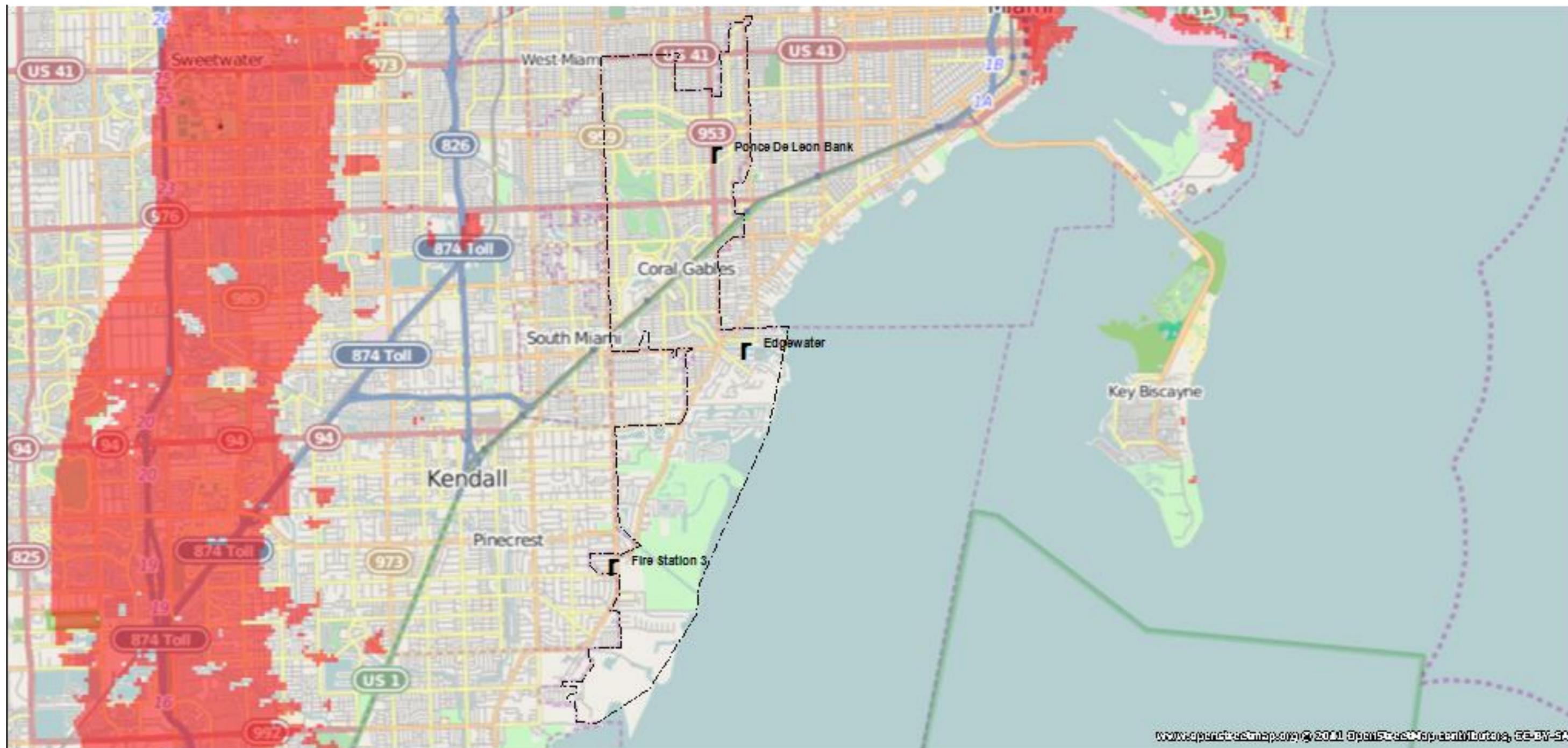
< -105dBm
DAQ4.0 @ boundary

Bounded Area Percent Coverage:
Meets or Exceeds 95%

MAP NUMBER: 1 OF 16

EXPECTED TALK OUT TO PORTABLE

ON HIP OUTDOORS

CORAL GABLES, FL
P25 PUBLIC SAFETY RADIO
COMMUNICATIONS SYSTEM

■ **< -105dBm**
DAQ4.0 @ boundary

Bounded Area Percent Coverage:
Meets or Exceeds 95%

MAP NUMBER: 2 OF 16

EXPECTED TALK BACK FROM PORTABLE
ON HIP OUTDOORS

CORAL GABLES, FL
P25 PUBLIC SAFETY RADIO
COMMUNICATIONS SYSTEM

< -93dBm
(-12 dB residential)

Bounded Area Percent Coverage:
Meets or Exceeds 95%

MAP NUMBER: 3 OF 16

EXPECTED TALK OUT TO PORTABLE WITH 12 dB BUILDING LOSS
ON HIP OUTDOORS

CORAL GABLES, FL
P25 PUBLIC SAFETY RADIO
COMMUNICATIONS SYSTEM

< -93dBm
(-12 dB residential)

Bounded Area Percent Coverage:
Meets or Exceeds 95%

MAP NUMBER: 4 OF 16

EXPECTED TALK BACK FROM PORTABLE   WITH 12 dB BUILDING LOSS
ON HIP OUTDOORS

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■ < -90dBm
(-15 dB Building)

Expected Bounded Area Coverage

MAP NUMBER: 5 OF 16

EXPECTED TALK OUT TO PORTABLE WITH 15 dB BUILDING LOSS
ON HIP OUTDOORS

**< -90dBm
(-15 dB Building)**

Expected Bounded Area Coverage

MAP NUMBER: 6 OF 16

**EXPECTED TALK BACK FROM PORTABLE WITH 15 dB BUILDING LOSS
ON HIP OUTDOORS**

**< -80dBm
(-25 dB Building)**

Expected Bounded Area Coverage

MAP NUMBER: 7 OF 16

**EXPECTED TALK OUT TO PORTABLE WITH 25 dB BUILDING LOSS
ON HIP OUTDOORS**

3 - SITE P25 SIMULCAST SYSTEM
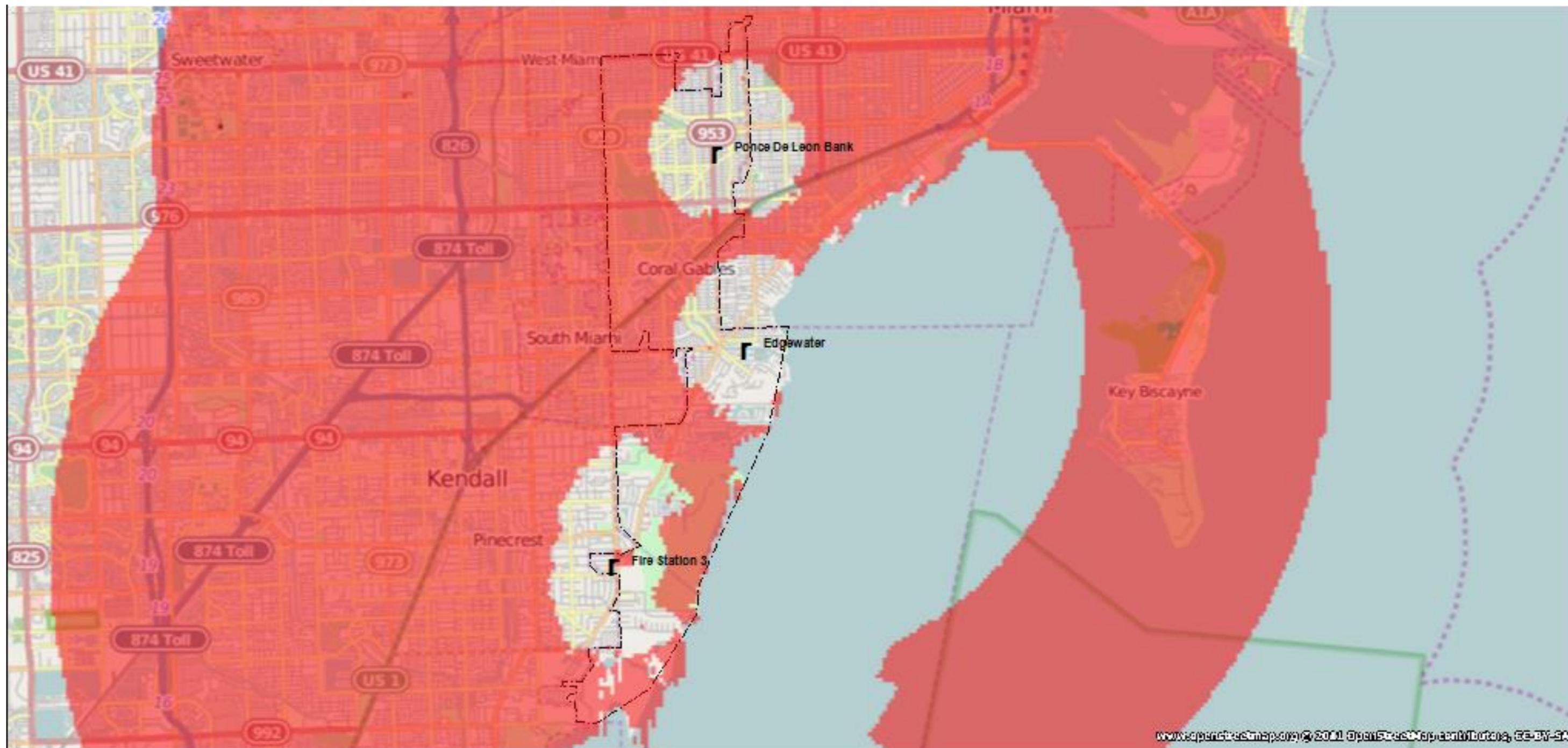
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< -80dBm
(-25 dB Building)

Expected Bounded Area Coverage

EXPECTED TALK BACK FROM PORTABLE WITH 25 dB BUILDING LOSS
ON HIP OUTDOORS

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3 - SITE P25 SIMULCAST SYSTEM
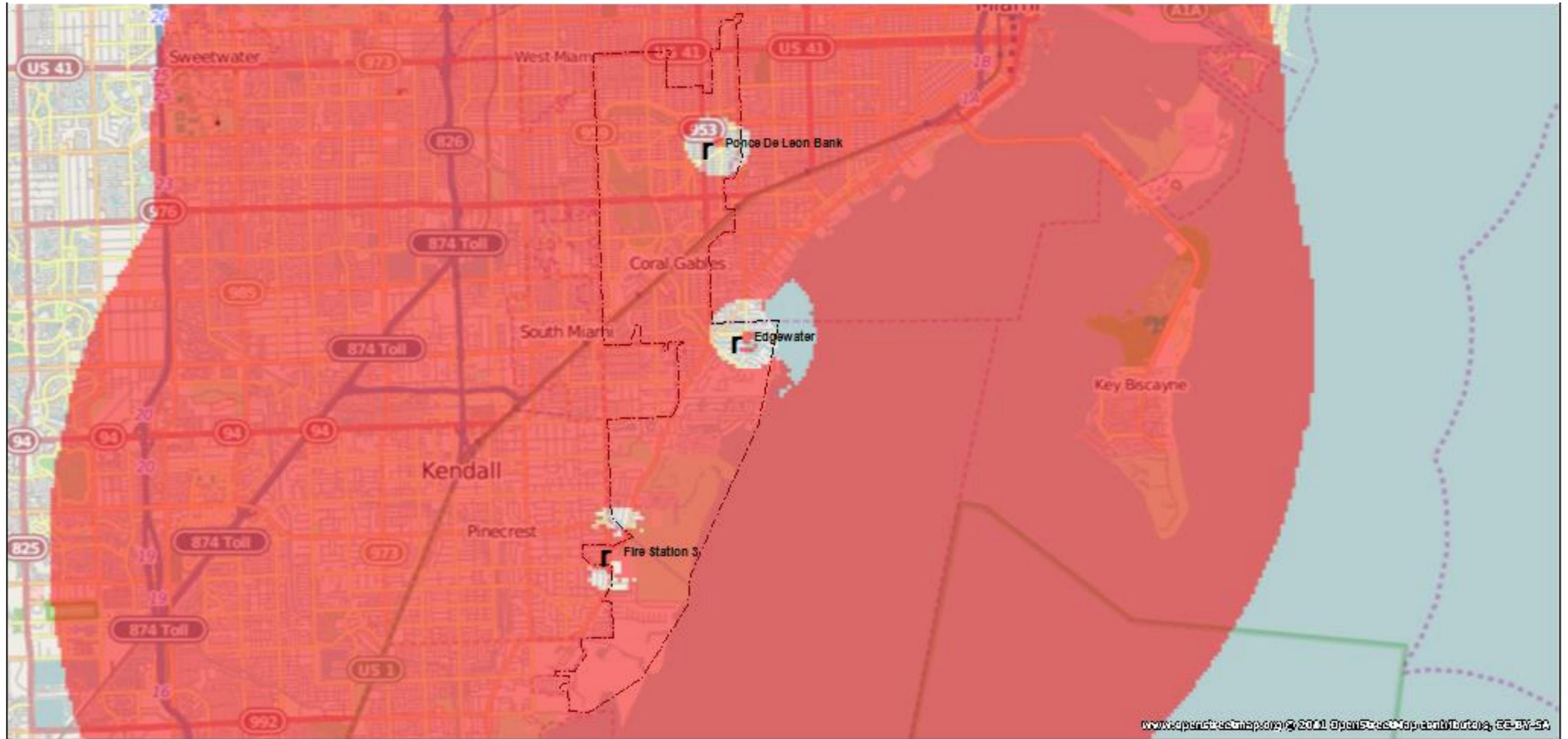
**< -65dBm
(-40 dB Building)**

Expected Bounded Area Coverage

MAP NUMBER: 9 OF 16

EXPECTED TALK OUT TO PORTABLE WITH 40 dB BUILDING LOSS
ON HIP OUTDOORS
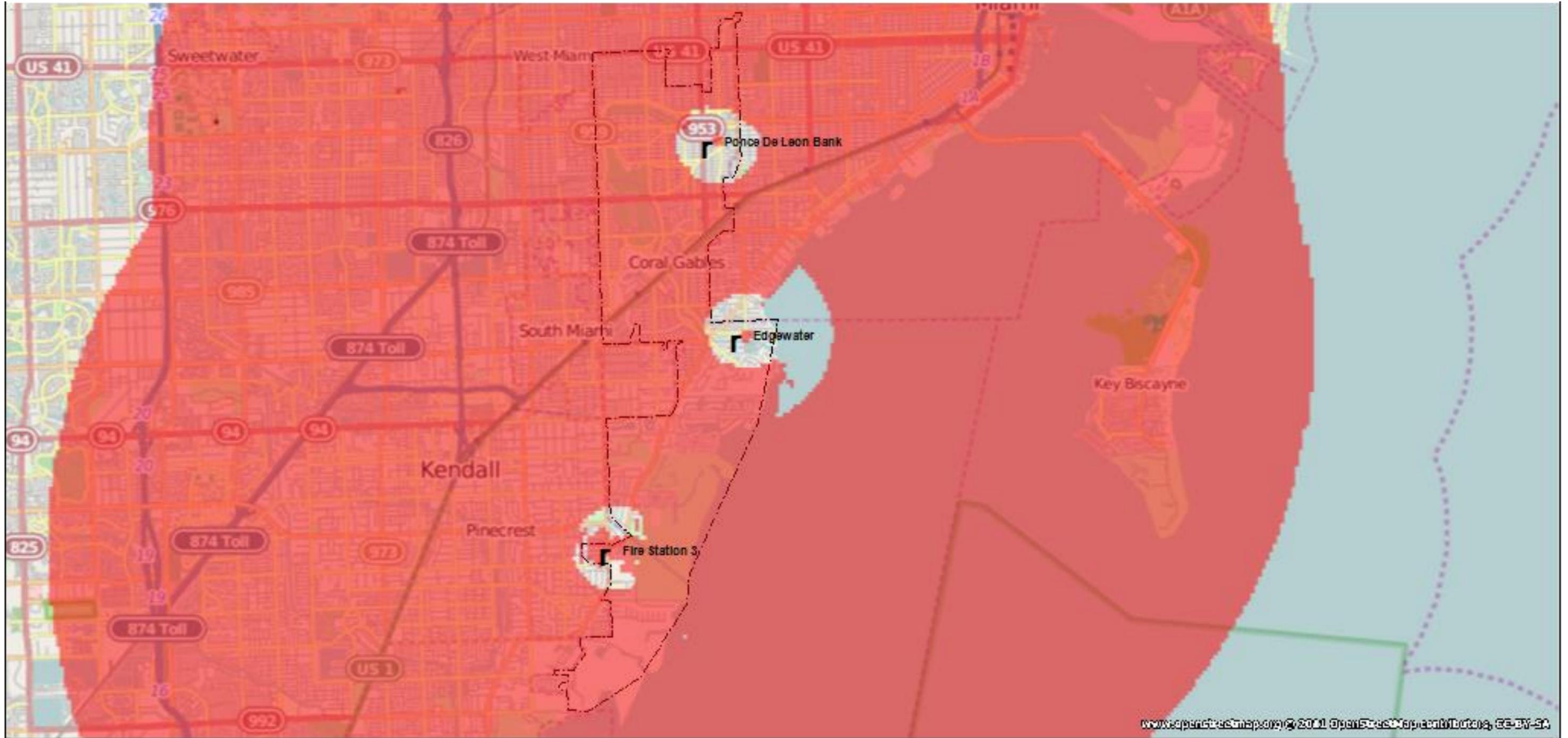
< -65dBm
(-40 dB Building)

Expected Bounded Area Coverage

MAP NUMBER: 10 OF 16

EXPECTED TALK BACK FROM PORTABLE WITH 40 dB BUILDING LOSS
ON HIP OUTDOORS

■ < -105dBm

Expected Bounded Area Coverage
Ponce de Leon Site Only

MAP NUMBER: 11 OF 16

EXPECTED TALK OUT TO PORTABLE
ON HIP OUTDOORS FROM PONCE de LEON SITE

CORAL GABLES, FL
P25 PUBLIC SAFETY RADIO
COMMUNICATIONS SYSTEM
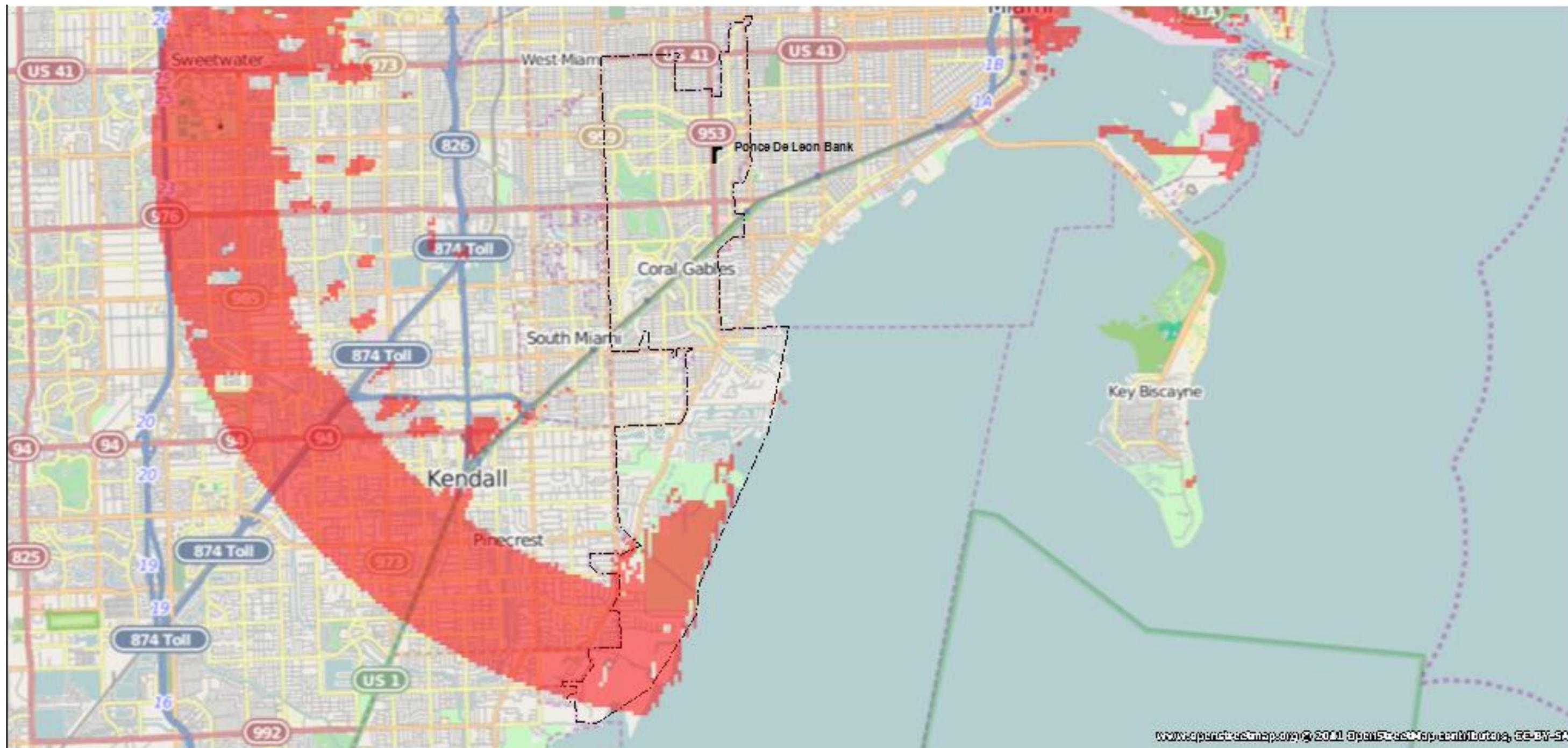
< -105dBm

Expected Bounded Area Coverage
Ponce de Leon Site Only

MAP NUMBER: 12 OF 16

EXPECTED TALK OUT FROM PORTABLE
ON HIP OUTDOORS FROM PONCE de LEON SITE

COMMUNICATIONS INTERNATIONAL
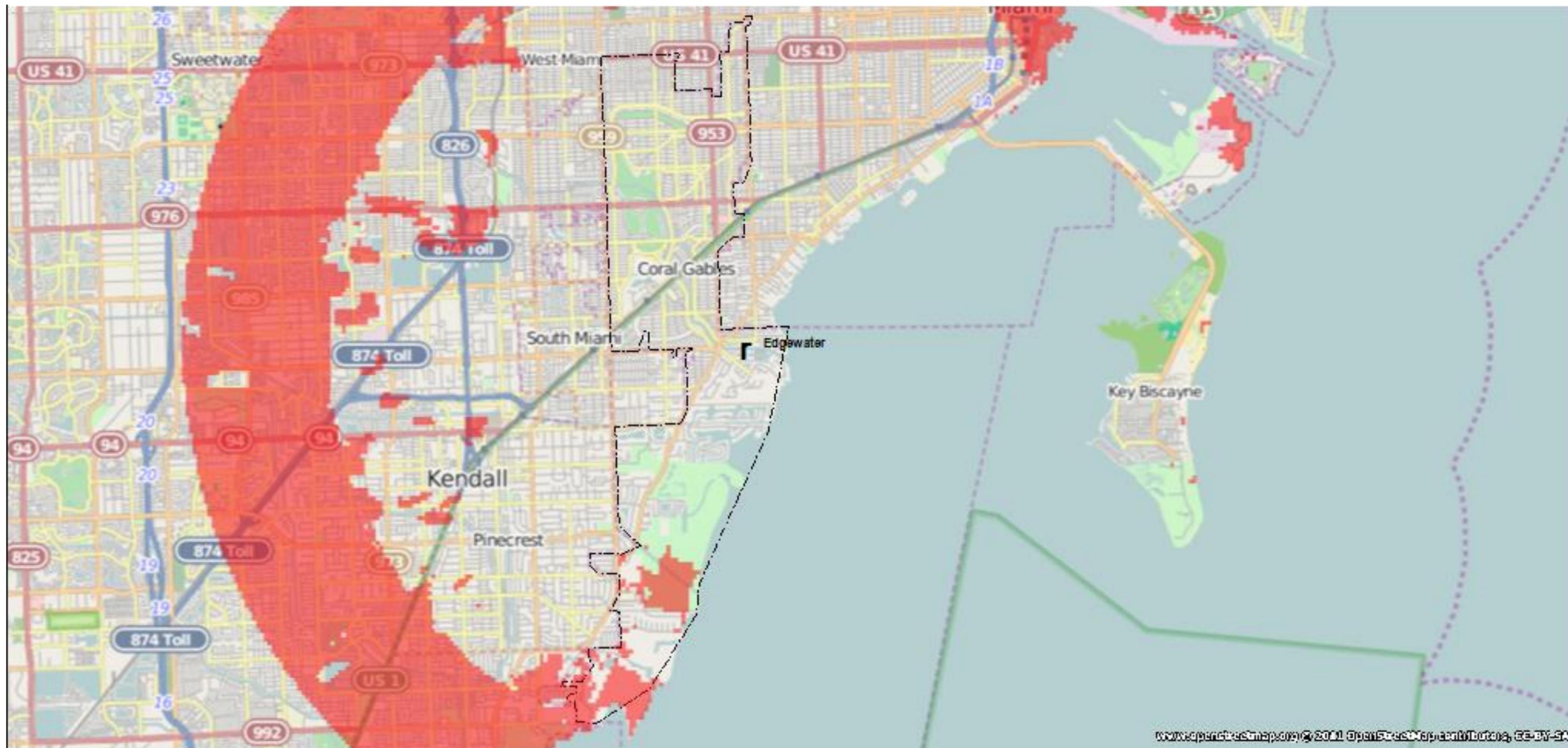
< -105dBm

Expected Bounded Area Coverage
Edgewater Site Only

MAP NUMBER: 13 OF 16

EXPECTED TALK OUT TO PORTABLE
ON HIP OUTDOORS FROM EDGEWATER SITE

COMMUNICATIONS
INTERNATIONAL
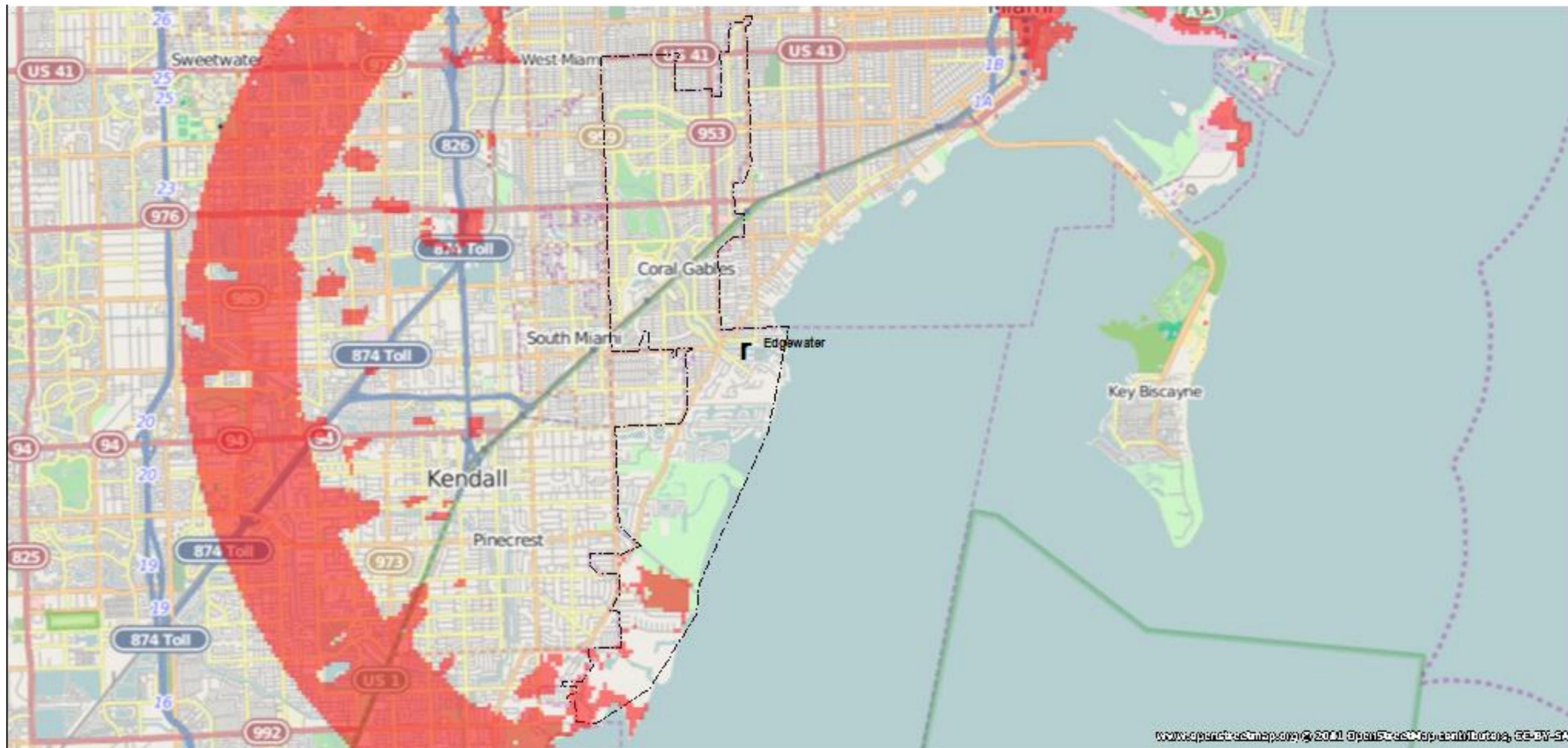
■ < -105dBm

Expected Bounded Area Coverage
Edgewater Site Only

MAP NUMBER: 14 OF 16

EXPECTED TALK BACK FROM PORTABLE
ON HIP OUTDOORS FROM EDGEWATER SITE
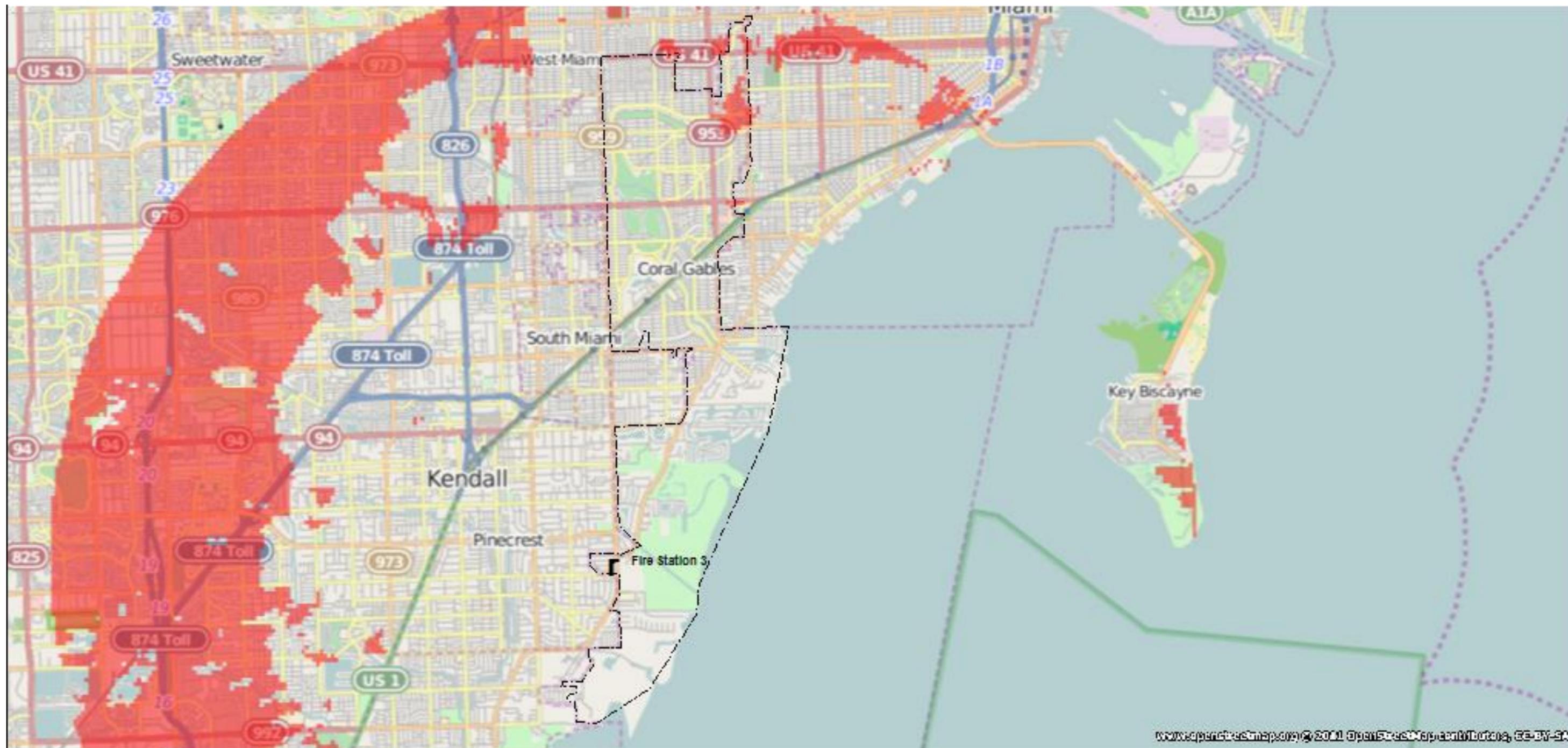
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Expected Bounded Area Coverage
Fire Station 3 Site Only

MAP NUMBER: 15 OF 16

EXPECTED TALK OUT TO PORTABLE
ON HIP OUTDOORS FIRE STATION 3

COMMUNICATIONS INTERNATIONAL
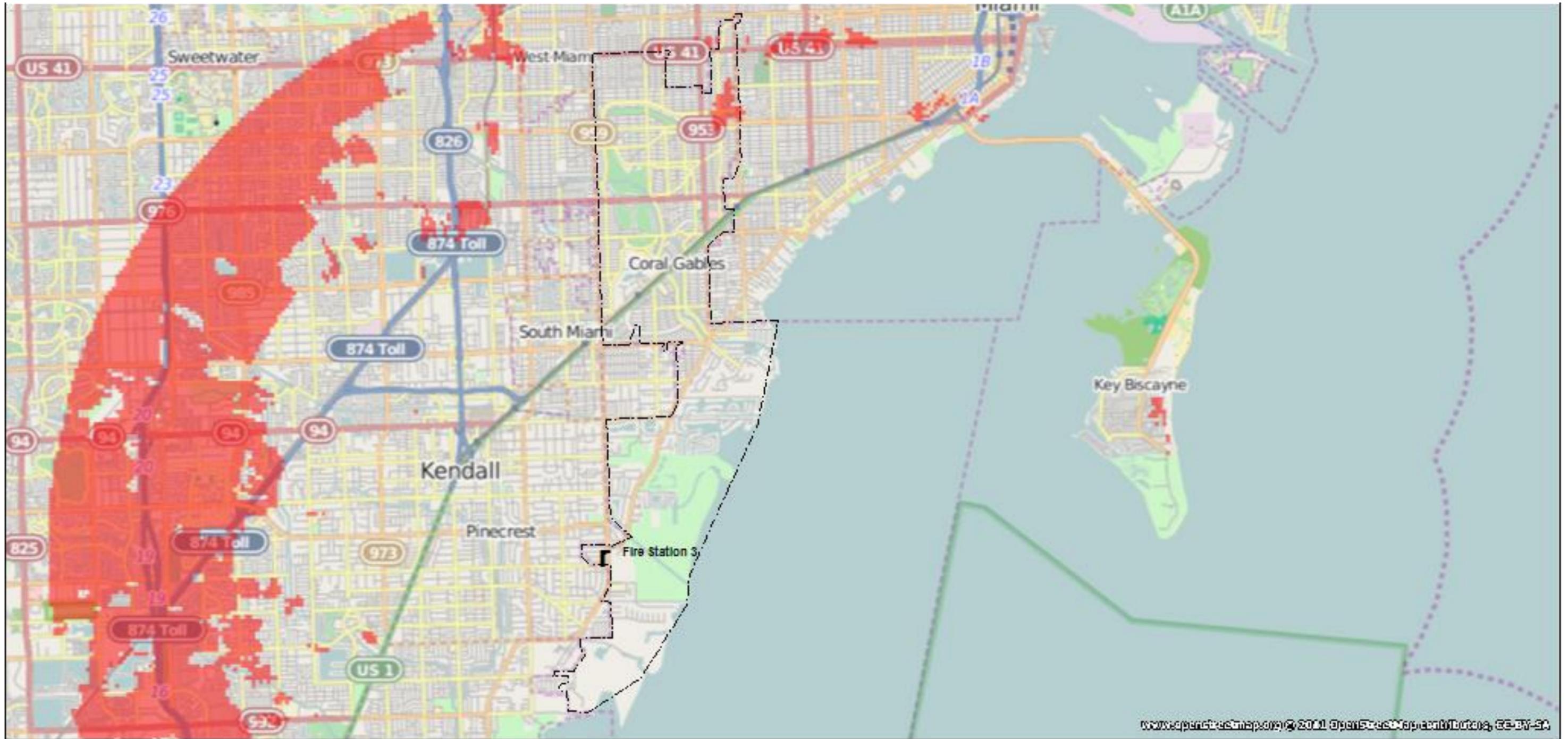
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Expected Bounded Area Coverage
Fire Station 3 Site Only

MAP NUMBER: 16 OF 16

EXPECTED TALK BACK FROM PORTABLE
ON HIP OUTDOORS FROM FIRE STATION 3

EQUIPMENT LIST

Vendor	Item	Part Number	Description	Quantity
Harris	10	NS-PNSD	SERVER, REDUNDANT PREMIER NSC,VMWARE	1
Harris	20	NS-SN5K	SERVICE,SYBASE LICENSE	2
Harris	40	NS-SG2D	LICENSE,HA,HARDWARE,NSC	1
Harris	50	NS-SG2M	LICENSE,P25 APPLICATION	1
Harris	60	NS-SG2F	LICENSE,NETWORK FIRST APPLICATION	1
Harris	70	MANS-NCU3D	Kit,1RU Monitor,Key Board,Mouse,KVM	1
Harris	80	NS-CA5G	CABINET,NSS,42 RU,120V	1
Harris	90	NS-ZN4M	KIT,110VAC,PREMIER NSC,HW HA	1
Harris	100	MANS-MN9S	Panel,Blank,1RU	3
Harris	130	MANS-MN9T	Panel,Blank,2RU	3
Harris	160	MANS-MN9U	Panel,Blank,3 RU	2
Harris	180	NS-ZN4P	KIT,ETHERNET,PREMIER NSC,HW HA	1
Harris	190	NS-PKGBN	PACKAGE,BEON,FOUNDATION,+25 USERS	1
Harris	200	MANS-CP9B	Netclock,GPS Master Clock	1
Harris	210	MANS-AN3S	Kit,GPS Antenna,Outdoor,For Netclock	1
Harris	220	MANS-CK1A	Cable,GPS Ant Outdoor,100ft/Netclock	1
Harris	230	NS-DW1J	DRAWINGS,SR10A,PREMIER,SNGL RT/SW	1
Harris	240	NM-SU3K	STORAGE ARRAY NETWORK, NETAPP SAN	1
Harris	250	MANM-NSG9C	License,Quad Mode Vocoder	1
Harris	260	MANM-NSG9C	License,Quad Mode Vocoder	1
Harris	270	NM-NG1Z	LICENSE,SQL STANDARD EDITION	1
Harris	280	NM-VM2B	SOFTWARE,PREMIER CORE,VM	1
Harris	290	NM-NG1Z	LICENSE,SQL STANDARD EDITION	1
Harris	300	NM-SG9B	LICENSE,DEVICE MANAGER PREMIUM	2
Harris	320	NS-PNSD	SERVER,PREMIER NSC,VMWARE	1
Harris	330	NS-SN5K	SERVICE,SYBASE LICENSE	2
Harris	350	VSVS02	VIDA Security, NSC	1
Harris	360	CM-027501-100102	License,Quest Authentication,Server	7
Harris	430	CM-027501-100103	License,Quest Authentication,User	6
Harris	490	VS-CR34	ROUTER,2921,AC,L3 SWITCH MDL,NO ENCRYPT	1
Harris	500	VSEPOVM	Software, Epolicy Orch VM	1
Harris	510	VSCR21	Firewall, Cisco ASA 5505	1
Harris	520	VSSD03	LICENSE,SUMS,ENDPOINT	14
Harris	530	VSSD04	LICENSE,SUMS,CORE	24
Harris	540	VS-SG3T	LICENSE,HOST SECURITY,AV,EPO,QTY 26-50	34
Harris	550	SS-SN9P	SERVICE,SUMS	1
Harris	560	NS-SG2B	LICENSE,CONSOLE	11

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Vendor	Item	Part Number	Description	Quantity
Harris	570	NS-SG2C	LICENSE,CONSOLE TALKPATH	72
Harris	580	NS-SG2N	LICENSE,P25 SITE	3
Harris	590	NS-SG2P	LICENSE,P25 SITE TALKPATH	20
Harris	600	NS-SG2G	LICENSE,NETWORK FIRST SITE	1
Harris	610	NS-SG2H	LICENSE,NETWORK FIRST TALKPATH	48
Harris	620	NS-SG7R	LICENSE,NSS,IP LOGGING RECORDER	1
Harris	630	NS-SG7S	LICENSE,NSS,IP LOGGING RECORDER TALKPATH	20
Harris	640	NS-SN2G	LICENSE,VMWARE,FED	1
Harris	650	NS-SN2E	LICENSE,VMWARE,VCENTER,FOUNDATION,FED	1
Harris	660	NS-SN2F	LICENSE,VMWARE,VCENTER,FOUNDATION,3Y,FED	1
Harris	670	CM-009172-012	6ft USB Cable Kit for KVM Switches	1
Harris	680	A30-1564-001	PRINTER, LASERJET(TM) PRO400 COLOR, M45	1
Harris	690	BM-PKGCL	PACKAGE,5 BEON USER LICENSES,ANDROID	2
Harris	700	BM-PKGCL-IOS	PACKAGE,5 BEON USER LICENSES,IOS	1
Harris	710	BM-PK1D	FEATURE,AES ENCRYPTION	25
Harris	720	MANG-GTWY	System Equipment,Interop Gateway	1
Harris	730	MANG-SN5M	SERVICE,QUAD MODE VOCODER LICENSE	48
Harris	1210	MANG-NFW2C	SOFTWARE,UAC GWB,AES	1
Harris	1220	MANG-4DVUS	Chassis,4-Slot Interoperability Gateway	4
Harris	1260	MANG-NMN2U	Bracket Kit, Interoperability Gateway	4
Harris	1300	MANG-CA3F	Cabinet,83in,Interoperability Gateway	1
Harris	1310	MANG-NPS2J	Power Supply,AC,4-Slot Gateway Chassis	8
Harris	1390	MANG-NAA3E	Module,DVU,UAC,Interoperability Gateway	9
Harris	1480	MANG-NCL8S	Cable,Ethernet,6ft	9
Harris	1570	MANG-NCA3L	Cable,Audio,4-Slot Chassis GWB,10ft	36
Harris	1930	MANG-MN2A	Panel,Filler	7
Harris	2000	VSVS01	VS Prod Grp,Dummy Model Number	1
Harris	2010	VS-CR32	ROUTER,1921,AC,NO ENCRYPTION,CISCO	1
Harris	2020	VS-MN3E	KIT,MOUNTING HARDWARE,1921 ROUTER	1
Harris	2030	VSCU3H	Switch,Cisco 2960	1
Harris	2040	VSMA6N	KIT,MTG HDWR,CISCO 2960 MASTR III/V CAB	1
Harris	2050	MAMM-200NG	Manual,Instal,4-Slot,Intrperabilty Gtwy	1
Harris	2060	VSVS01	VS Prod Grp,Dummy Model Number	1
Harris	2070	VS-CR32	ROUTER,1921,AC,NO ENCRYPTION,CISCO	1
Harris	2080	VS-MN3E	KIT,MOUNTING HARDWARE,1921 ROUTER	1
Harris	2090	VSCU3H	Switch,Cisco 2960	1
Harris	2100	VSMA6N	KIT,MTG HDWR,CISCO 2960 MASTR III/V CAB	1
Harris	2110	UD-ZN4Z	CONSOLE,SYMPHONY,BUNDLE,PREMIER	8
Harris	2120	UD-SG4W	LICENSE,AES LEVEL ENCRYPTION	8
Harris	2130	UD-SG4T	LICENSE,CONVENTIONAL CONTROLS	8

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Vendor	Item	Part Number	Description	Quantity
Harris	2140	UD-AB1A	SPEAKER, NANO, SYMPHONY	16
Harris	2160	UD-CU6X	MONITOR, 21.5" CLASS,TOUCHSCREEN,HD	8
Harris	2170	UD-AB1K	CABLE,DISPLAYPORT TO DVI-D,10FT	8
Harris	2180	UD-AB1F	MOUSE, OPTICAL, USB, SCROLL WHEEL	8
Harris	2190	UD-AB1G	KEYBOARD, 104 KEY, USB, HUB	8
Harris	2200	UD-AB1D	SINGLE FOOTSWITCH, USB, SYMPHONY	8
Harris	2210	UD-AB1M	DESK MIC, DB9	8
Harris	2220	UD-AB1B	JACK BOX, 6 WIRE	8
Harris	2230	CM-022218-001101	License P25,Vocoder	8
Harris	2240	MM100UD	MANUAL,OP/INSTA/CONFIG,SYMPHONY,CD	8
Harris	2250	VSVS01	VS Prod Grp,Dummy Model Number	1
Harris	2260	VS-CR32	ROUTER,1921,AC,NO ENCRYPTION,CISCO	1
Harris	2270	VS-MN3E	KIT,MOUNTING HARDWARE,1921 ROUTER	1
Harris	2280	VS-CU5F	8-PORT,EHWIC,GIGABIT ETHERNET,FIBER	1
Harris	2290	UD-ZN4Z	CONSOLE,SYMPHONY,BUNDLE,PREMIER	4
Harris	2300	UD-SG4W	LICENSE,AES LEVEL ENCRYPTION	4
Harris	2310	UD-AB1A	SPEAKER, NANO, SYMPHONY	8
Harris	2330	UD-CU6X	MONITOR, 21.5" CLASS,TOUCHSCREEN,HD	4
Harris	2340	UD-AB1K	CABLE,DISPLAYPORT TO DVI-D,10FT	4
Harris	2350	UD-AB1F	MOUSE, OPTICAL, USB, SCROLL WHEEL	4
Harris	2360	UD-AB1G	KEYBOARD, 104 KEY, USB, HUB	4
Harris	2370	UD-AB1D	SINGLE FOOTSWITCH, USB, SYMPHONY	4
Harris	2380	UD-AB1M	DESK MIC, DB9	4
Harris	2390	UD-AB1B	JACK BOX, 6 WIRE	4
Harris	2400	CM-022218-3006WJ	Adapter,6 Wire Jackbox to Headset	4
Harris	2410	CM-022218-001101	License,Vocoder	4
Harris	2420	MM100UD	MANUAL,OP/INSTA/CONFIG,SYMPHONY,CD	4
Harris	2430	SC-VTXP25	MASTR V IP Simulcast,Tx Site,Comm Equip	1
Harris	2440	SCCL7D	Kit,Cable,Ethernet,5ft	1
Harris	2450	SCCF7X	Cable,RF Sensor,30ft	1
Harris	2460	MASC-NPS9T	Power Supply,120VAC,60Hz,12/24VDC	1
Harris	2470	MASC-NMR1H	Rack,Open,86 in(Xtra Dp) with support	1
Harris	2480	CP-MD7B	Assy,Controller,SitePro,MME w/ Cables	1
Harris	2490	VSVS01	VS Prod Grp,Dummy Model Number	1
Harris	2500	VSCR12	Router,2921,AC,Security,w/Ether Switch	1
Harris	2510	VSMN2W	Kit,Mnt Hrdwr,2921/2911 Router	1
Harris	2520	VSCU3H	Switch,Cisco 2960	1
Harris	2530	VSMA6N	KIT,MTG HDWR,CISCO 2960 MASTR III/V CAB	1
Harris	2540	VS-CU6G	MODULE,CISCO EHWIC-4ESG 4-PORT GIG INT	1
Harris	2550	SC-MD7A	Network Sentry,IP Simulcast	1

Vendor	Item	Part Number	Description	Quantity
Harris	2560	AW-L1-PNMNM-50	Cable,GPS Antenna,50ft	1
Harris	2570	AW-L1-PNMNM-50	Cable,GPS Antenna,50ft	1
Harris	2580	SA-KRE1011217/02	ANTENNA,1574-1606 MHZ,WITH MOUNT	2
Harris	2590	PT-018602-001	Filter,Surge Protector,800-2500MHz	2
Harris	2600	CP-SG4H	LICENSE,SW,CP	1
Harris	2610	MASV-800M1	Station,MASTR V,P25T,800 MHz,799-817 Rx	1
Harris	2620	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	2630	SV-AW5R	Power Amplifier,Linear,800 MHz	1
Harris	2640	SV-RB3K	Busbar,HPA/PS,MASTR V	1
Harris	2650	MASV-NPS2P	Power Supply,110-240V,AC,MASTR V	1
Harris	2660	SV-SP2U	Programming,IP Simulcast	1
Harris	2670	SV-RB3B	Power Supply Shelf,1st Position	1
Harris	2680	SV-CA5J	CABLE,DC POWER,48 IN	2
Harris	2700	SV-DW1B	Drawings,IP Simulcast/P25 Trunked	1
Harris	2710	SV-RB3G	Shelf,14-Slot,Open Rack	1
Harris	2720	SV-PM1C	Processor,Baseband Module,MASTR V	1
Harris	2730	MASV-NZN8S	Fan Tray,MASTR V	1
Harris	2740	SV-ZN9K	PANEL,XCONNECT,MASTR V	1
Harris	2750	SV-CL2D	Cable,Xconnect-Baseband Shelf #1	1
Harris	2760	SV-CL9V	Kit,Cable,Ch #1,2,9,10,17,18 MASTR V IP	1
Harris	2770	SV-CL9Z	Cable Assembly RF,RG223,BNC/SMA,4ft	1
Harris	2780	SV-MN9S	Panel,Blank,1 RU	1
Harris	2790	MASV-NMA6Q	Grounding Shim,28RU	1
Harris	2800	MASV-NCN7R	Power Strip,110VAC,2X20A Brkr,2-Cbl,6Pos	2
Harris	2820	MASV-NCN1Z	Outlet Strip,110 VAC,UL Recognized	1
Harris	2830	MASV-800M1	Station,MASTR V,P25T,800 MHz,799-817 Rx	1
Harris	2840	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	2850	SV-AW5R	Power Amplifier,Linear,800 MHz	1
Harris	2860	SV-RB3K	Busbar,HPA/PS,MASTR V	1
Harris	2870	MASV-NPS2P	Power Supply,110-240V,AC,MASTR V	1
Harris	2880	SV-SP2U	Programming,IP Simulcast	1
Harris	2890	SV-RB3A	Power Supply Shelf,2nd Position	1
Harris	2900	SV-CL9V	Kit,Cable,Ch #1,2,9,10,17,18 MASTR V IP	1
Harris	2910	MASV-800M1	Station,MASTR V,P25T,800 MHz,799-817 Rx	1
Harris	2920	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	2930	SV-AW5R	Power Amplifier,Linear,800 MHz	1
Harris	2940	SV-RB3K	Busbar,HPA/PS,MASTR V	1
Harris	2950	MASV-NPS2P	Power Supply,110-240V,AC,MASTR V	1
Harris	2960	SV-SP2U	Programming,IP Simulcast	1
Harris	2970	SV-RB3C	Power Supply Shelf	1

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Vendor	Item	Part Number	Description	Quantity
Harris	2980	SV-PM1C	Processor,Baseband Module,MASTR V	1
Harris	2990	SV-CL2D	Cable,Xconnect-Baseband Shelf #1	1
Harris	3000	SV-CL9W	Kit,Cable,Ch #3,4,11,12,19,20 MASTR V IP	1
Harris	3010	SV-CL2A	Cable Assembly RF,RG223,BNC/SMA,3ft	1
Harris	3020	MASV-800M1	Station,MASTR V,P25T,800 MHz,799-817 Rx	1
Harris	3030	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	3040	SV-AW5R	Power Amplifier,Linear,800 MHz	1
Harris	3050	SV-RB3K	Busbar,HPA/PS,MASTR V	1
Harris	3060	MASV-NPS2P	Power Supply,110-240V,AC,MASTR V	1
Harris	3070	SV-SP2U	Programming,IP Simulcast	1
Harris	3080	SV-RB3C	Power Supply Shelf	1
Harris	3090	SV-CL9W	Kit,Cable,Ch #3,4,11,12,19,20 MASTR V IP	1
Harris	3100	MASV-800M1	Station,MASTR V,P25T,800 MHz,799-817 Rx	1
Harris	3110	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	3120	SV-AW5R	Power Amplifier,Linear,800 MHz	1
Harris	3130	SV-RB3K	Busbar,HPA/PS,MASTR V	1
Harris	3140	MASV-NPS2P	Power Supply,110-240V,AC,MASTR V	1
Harris	3150	SV-SP2U	Programming,IP Simulcast	1
Harris	3160	SV-RB3C	Power Supply Shelf	1
Harris	3170	SV-CA5J	CABLE,DC POWER,48 IN	2
Harris	3190	SV-RB3G	Shelf,14-Slot,Open Rack	1
Harris	3200	SV-PM1C	Processor,Baseband Module,MASTR V	1
Harris	3210	SV-CL2E	Cable,Xconnect-Baseband Shelf #2	1
Harris	3220	SV-CL9X	Kit,Cable,Ch #5,6,13,14,21,22 MASTR V IP	1
Harris	3230	SV-CL9Z	Cable Assembly RF,RG223,BNC/SMA,4ft	1
Harris	3240	MASV-800M1	Station,MASTR V,P25T,800 MHz,799-817 Rx	1
Harris	3250	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	3260	SV-AW5R	Power Amplifier,Linear,800 MHz	1
Harris	3270	SV-RB3K	Busbar,HPA/PS,MASTR V	1
Harris	3280	MASV-NPS2P	Power Supply,110-240V,AC,MASTR V	1
Harris	3290	SV-SP2U	Programming,IP Simulcast	1
Harris	3300	SV-RB3C	Power Supply Shelf	1
Harris	3310	SV-CL9X	Kit,Cable,Ch #5,6,13,14,21,22 MASTR V IP	1
Harris	3320	MASV-800M1	Station,MASTR V,P25T,800 MHz,799-817 Rx	1
Harris	3330	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	3340	SV-AW5R	Power Amplifier,Linear,800 MHz	1
Harris	3350	SV-RB3K	Busbar,HPA/PS,MASTR V	1
Harris	3360	MASV-NPS2P	Power Supply,110-240V,AC,MASTR V	1
Harris	3370	SV-SP2U	Programming,IP Simulcast	1
Harris	3380	SV-RB3C	Power Supply Shelf	1

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Vendor	Item	Part Number	Description	Quantity
Harris	3390	SV-PM1C	Processor,Baseband Module,MASTR V	1
Harris	3400	SV-CL2E	Cable,Xconnect-Baseband Shelf #2	1
Harris	3410	SV-CL9Y	Kit,Cable,Ch #7,8,15,16,23,24 MASTR V IP	1
Harris	3420	SV-CL2A	Cable Assembly RF,RG223,BNC/SMA,3ft	1
Harris	3430	MASV-800M1	Station,MASTR V,P25T,800 MHz,799-817 Rx	1
Harris	3440	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	3450	SV-AW5R	Power Amplifier,Linear,800 MHz	1
Harris	3460	SV-RB3K	Busbar,HPA/PS,MASTR V	1
Harris	3470	MASV-NPS2P	Power Supply,110-240V,AC,MASTR V	1
Harris	3480	SV-SP2U	Programming,IP Simulcast	1
Harris	3490	SV-RB3C	Power Supply Shelf	1
Harris	3500	SV-CL9Y	Kit,Cable,Ch #7,8,15,16,23,24 MASTR V IP	1
Harris	3510	MASV-XXXXX	MASTR V,Dummy Model Number	1
Harris	3520	MASV-NMR1H	Rack,Open,86 in(Xtra Dp) with support	1
Harris	3530	SV-ZN9L	Panel,Splitter, Expansion Cabinet	1
Harris	3540	SV-CK1K	Cable,Freq ref,Cabinet to Cabinet,16 Ft	1
Harris	3550	SV-CL2F	Cables,Xconnect-Xconnect	1
Harris	3560	SV-CL2V	Cable,RF,RG223,BNC/SMA,20ft	2
Harris	3580	SV-CK1K	Cable,Freq ref,Cabinet to Cabinet,16 Ft	1
Harris	3590	MASV-NPS9T	Power Supply,120VAC,60Hz,12/24VDC	1
Harris	3600	MASV-800M1	Station,MASTR V,P25T,800 MHz,799-817 Rx	1
Harris	3610	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	3620	SV-AW5R	Power Amplifier,Linear,800 MHz	1
Harris	3630	SV-RB3K	Busbar,HPA/PS,MASTR V	1
Harris	3640	MASV-NPS2P	Power Supply,110-240V,AC,MASTR V	1
Harris	3650	SV-SP2U	Programming,IP Simulcast	1
Harris	3660	SV-RB3B	Power Supply Shelf,1st Position	1
Harris	3670	SV-CA5J	CABLE,DC POWER,48 IN	2
Harris	3690	SV-DW1B	Drawings,IP Simulcast/P25 Trunked	1
Harris	3700	SV-RB3G	Shelf,14-Slot,Open Rack	1
Harris	3710	SV-PM1C	Processor,Baseband Module,MASTR V	1
Harris	3720	MASV-NZN8S	Fan Tray,MASTR V	1
Harris	3730	SV-ZN9K	PANEL,XCONNECT,MASTR V	1
Harris	3740	SV-CL2D	Cable,Xconnect-Baseband Shelf #1	1
Harris	3750	SV-CL9V	Kit,Cable,Ch #1,2,9,10,17,18 MASTR V IP	1
Harris	3760	SV-CL2B	Cable,Splitter-Baseband #1	1
Harris	3770	SV-MN9S	Panel,Blank,1 RU	1
Harris	3780	MASV-NMA6Q	Grounding Shim,28RU	1
Harris	3790	MASV-NCN7R	Power Strip,110VAC,2X20A Brkr,2-Cbl,6Pos	2
Harris	3810	MASV-NCN1Z	Outlet Strip,110 VAC,UL Recognized	1

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Vendor	Item	Part Number	Description	Quantity
Harris	3820	SV-CL9T	Cable,Switch-Switch	1
Harris	3830	MASV-800M1	Station,MASTR V,P25T,800 MHz,799-817 Rx	1
Harris	3840	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	3850	SV-AW5R	Power Amplifier,Linear,800 MHz	1
Harris	3860	SV-RB3K	Busbar,HPA/PS,MASTR V	1
Harris	3870	MASV-NPS2P	Power Supply,110-240V,AC,MASTR V	1
Harris	3880	SV-SP2U	Programming,IP Simulcast	1
Harris	3890	SV-RB3A	Power Supply Shelf,2nd Position	1
Harris	3900	SV-CL9V	Kit,Cable,Ch #1,2,9,10,17,18 MASTR V IP	1
Harris	3910	MASV-NZN8R	Panel,Blank Module,MASTR V	7
Harris	3980	SC-VTXP25	MASTR V IP Simulcast,Tx Site,Comm Equip	1
Harris	3990	SCCL7D	Kit,Cable,Ethernet,5ft	1
Harris	4000	SCCF7X	Cable,RF Sensor,30ft	1
Harris	4010	MASC-NPS9T	Power Supply,120VAC,60Hz,12/24VDC	1
Harris	4020	MASC-NMR1H	Rack,Open,86 in(Xtra Dp) with support	1
Harris	4030	CP-MD7B	Assy,Controller,SitePro,MME w/ Cables	1
Harris	4040	VSVS01	VS Prod Grp,Dummy Model Number	1
Harris	4050	VSCR12	Router,2921,AC,Security,w/Ether Switch	1
Harris	4060	VSMN2W	Kit,Mnt Hrdwr,2921/2911 Router	1
Harris	4070	VSCU3H	Switch,Cisco 2960	1
Harris	4080	VSMA6N	KIT,MTG HDWR,CISCO 2960 MASTR III/V CAB	1
Harris	4090	VS-CU6G	MODULE,CISCO EHWIC-4ESG 4-PORT GIG INT	1
Harris	4100	SC-MD7A	Network Sentry,IP Simulcast	1
Harris	4110	AW-L1-PNMNM-50	Cable,GPS Antenna,50ft	1
Harris	4120	AW-L1-PNMNM-50	Cable,GPS Antenna,50ft	1
Harris	4130	SA-KRE1011217/02	ANTENNA,1574-1606 MHZ,WITH MOUNT	2
Harris	4140	PT-018602-001	Filter,Surge Protector,800-2500MHz	2
Harris	4150	CP-SG4N	LICENSE,SW, ADDITIONAL CP	1
Harris	4160	MASV-800M1	Station,MASTR V,P25T,800 MHz,799-817 Rx	1
Harris	4170	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	4180	SV-AW5R	Power Amplifier,Linear,800 MHz	1
Harris	4190	SV-RB3K	Busbar,HPA/PS,MASTR V	1
Harris	4200	MASV-NPS2P	Power Supply,110-240V,AC,MASTR V	1
Harris	4210	SV-SP2U	Programming,IP Simulcast	1
Harris	4220	SV-RB3B	Power Supply Shelf,1st Position	1
Harris	4230	SV-CA5J	CABLE,DC POWER,48 IN	2
Harris	4250	SV-DW1B	Drawings,IP Simulcast/P25 Trunked	1
Harris	4260	SV-RB3G	Shelf,14-Slot,Open Rack	1
Harris	4270	SV-PM1C	Processor,Baseband Module,MASTR V	1
Harris	4280	MASV-NZN8S	Fan Tray,MASTR V	1

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Vendor	Item	Part Number	Description	Quantity
Harris	4290	SV-ZN9K	PANEL,XCONNECT,MASTR V	1
Harris	4300	SV-CL2D	Cable,Xconnect-Baseband Shelf #1	1
Harris	4310	SV-CL9V	Kit,Cable,Ch #1,2,9,10,17,18 MASTR V IP	1
Harris	4320	SV-CL9Z	Cable Assembly RF,RG223,BNC/SMA,4ft	1
Harris	4330	SV-MN9S	Panel,Blank,1 RU	1
Harris	4340	MASV-NMA6Q	Grounding Shim,28RU	1
Harris	4350	MASV-NCN7R	Power Strip,110VAC,2X20A Brkr,2-Cbl,6Pos	2
Harris	4370	MASV-NCN1Z	Outlet Strip,110 VAC,UL Recognized	1
Harris	4280	MASV-NZN8S	Fan Tray,MASTR V	1
Harris	4290	SV-ZN9K	PANEL,XCONNECT,MASTR V	1
Harris	4300	SV-CL2D	Cable,Xconnect-Baseband Shelf #1	1
Harris	4310	SV-CL9V	Kit,Cable,Ch #1,2,9,10,17,18 MASTR V IP	1
Harris	4320	SV-CL9Z	Cable Assembly RF,RG223,BNC/SMA,4ft	1
Harris	4330	SV-MN9S	Panel,Blank,1 RU	1
Harris	4340	MASV-NMA6Q	Grounding Shim,28RU	1
Harris	4350	MASV-NCN7R	Power Strip,110VAC,2X20A Brkr,2-Cbl,6Pos	2
Harris	4370	MASV-NCN1Z	Outlet Strip,110 VAC,UL Recognized	1
Harris	4380	MASV-800M1	Station,MASTR V,P25T,800 MHz,799-817 Rx	1
Harris	4390	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	4400	SV-AW5R	Power Amplifier,Linear,800 MHz	1
Harris	4410	SV-RB3K	Busbar,HPA/PS,MASTR V	1
Harris	4420	MASV-NPS2P	Power Supply,110-240V,AC,MASTR V	1
Harris	4430	SV-SP2U	Programming,IP Simulcast	1
Harris	4440	SV-RB3A	Power Supply Shelf,2nd Position	1
Harris	4450	SV-CL9V	Kit,Cable,Ch #1,2,9,10,17,18 MASTR V IP	1
Harris	4460	MASV-800M1	Station,MASTR V,P25T,800 MHz,799-817 Rx	1
Harris	4470	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	4480	SV-AW5R	Power Amplifier,Linear,800 MHz	1
Harris	4490	SV-RB3K	Busbar,HPA/PS,MASTR V	1
Harris	4500	MASV-NPS2P	Power Supply,110-240V,AC,MASTR V	1
Harris	4510	SV-SP2U	Programming,IP Simulcast	1
Harris	4520	SV-RB3C	Power Supply Shelf	1
Harris	4530	SV-PM1C	Processor,Baseband Module,MASTR V	1
Harris	4540	SV-CL2D	Cable,Xconnect-Baseband Shelf #1	1
Harris	4550	SV-CL9W	Kit,Cable,Ch #3,4,11,12,19,20 MASTR V IP	1
Harris	4560	SV-CL2A	Cable Assembly RF,RG223,BNC/SMA,3ft	1
Harris	4570	MASV-800M1	Station,MASTR V,P25T,800 MHz,799-817 Rx	1
Harris	4580	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	4590	SV-AW5R	Power Amplifier,Linear,800 MHz	1
Harris	4600	SV-RB3K	Busbar,HPA/PS,MASTR V	1

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Vendor	Item	Part Number	Description	Quantity
Harris	4610	MASV-NPS2P	Power Supply,110-240V,AC,MASTR V	1
Harris	4620	SV-SP2U	Programming,IP Simulcast	1
Harris	4630	SV-RB3C	Power Supply Shelf	1
Harris	4640	SV-CL9W	Kit,Cable,Ch #3,4,11,12,19,20 MASTR V IP	1
Harris	4650	MASV-800M1	Station,MASTR V,P25T,800 MHz,799-817 Rx	1
Harris	4660	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	4670	SV-AW5R	Power Amplifier,Linear,800 MHz	1
Harris	4680	SV-RB3K	Busbar,HPA/PS,MASTR V	1
Harris	4690	MASV-NPS2P	Power Supply,110-240V,AC,MASTR V	1
Harris	4700	SV-SP2U	Programming,IP Simulcast	1
Harris	4710	SV-RB3C	Power Supply Shelf	1
Harris	4720	SV-CA5J	CABLE,DC POWER,48 IN	2
Harris	4740	SV-RB3G	Shelf,14-Slot,Open Rack	1
Harris	4750	SV-PM1C	Processor,Baseband Module,MASTR V	1
Harris	4760	SV-CL2E	Cable,Xconnect-Baseband Shelf #2	1
Harris	4770	SV-CL9X	Kit,Cable,Ch #5,6,13,14,21,22 MASTR V IP	1
Harris	4780	SV-CL9Z	Cable Assembly RF,RG223,BNC/SMA,4ft	1
Harris	4790	MASV-800M1	Station,MASTR V,P25T,800 MHz,799-817 Rx	1
Harris	4800	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	4810	SV-AW5R	Power Amplifier,Linear,800 MHz	1
Harris	4820	SV-RB3K	Busbar,HPA/PS,MASTR V	1
Harris	4830	MASV-NPS2P	Power Supply,110-240V,AC,MASTR V	1
Harris	4840	SV-SP2U	Programming,IP Simulcast	1
Harris	4850	SV-RB3C	Power Supply Shelf	1
Harris	4860	SV-CL9X	Kit,Cable,Ch #5,6,13,14,21,22 MASTR V IP	1
Harris	4870	MASV-800M1	Station,MASTR V,P25T,800 MHz,799-817 Rx	1
Harris	4880	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	4890	SV-AW5R	Power Amplifier,Linear,800 MHz	1
Harris	4990	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	5000	SV-AW5R	Power Amplifier,Linear,800 MHz	1
Harris	5010	SV-RB3K	Busbar,HPA/PS,MASTR V	1
Harris	5020	MASV-NPS2P	Power Supply,110-240V,AC,MASTR V	1
Harris	5030	SV-SP2U	Programming,IP Simulcast	1
Harris	5040	SV-RB3C	Power Supply Shelf	1
Harris	5050	SV-CL9Y	Kit,Cable,Ch #7,8,15,16,23,24 MASTR V IP	1
Harris	5060	MASV-XXXXX	MASTR V,Dummy Model Number	1
Harris	5070	MASV-NMR1H	Rack,Open,86 in(Xtra Dp) with support	1
Harris	5080	SV-ZN9L	Panel,Splitter, Expansion Cabinet	1
Harris	5090	SV-CK1K	Cable,Freq ref,Cabinet to Cabinet,16 Ft	1
Harris	5100	SV-CL2F	Cables,Xconnect-Xconnect	1

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Vendor	Item	Part Number	Description	Quantity
Harris	5110	SV-CL2V	Cable,RF,RG223,BNC/SMA,20ft	2
Harris	5130	SV-CK1K	Cable,Freq ref,Cabinet to Cabinet,16 Ft	1
Harris	5140	MASV-NPS9T	Power Supply,120VAC,60Hz,12/24VDC	1
Harris	5150	MASV-800M1	Station,MASTR V,P25T,800 MHz,799-817 Rx	1
Harris	5160	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	5170	SV-AW5R	Power Amplifier,Linear,800 MHz	1
Harris	5180	SV-RB3K	Busbar,HPA/PS,MASTR V	1
Harris	5190	MASV-NPS2P	Power Supply,110-240V,AC,MASTR V	1
Harris	5200	SV-SP2U	Programming,IP Simulcast	1
Harris	5210	SV-RB3B	Power Supply Shelf,1st Position	1
Harris	5220	SV-CA5J	CABLE,DC POWER,48 IN	2
Harris	5240	SV-DW1B	Drawings,IP Simulcast/P25 Trunked	1
Harris	5250	SV-RB3G	Shelf,14-Slot,Open Rack	1
Harris	5260	SV-PM1C	Processor,Baseband Module,MASTR V	1
Harris	5270	MASV-NZN8S	Fan Tray,MASTR V	1
Harris	5280	SV-ZN9K	PANEL,XCONNECT,MASTR V	1
Harris	5290	SV-CL2D	Cable,Xconnect-Baseband Shelf #1	1
Harris	5300	SV-CL9V	Kit,Cable,Ch #1,2,9,10,17,18 MASTR V IP	1
Harris	5310	SV-CL2B	Cable,Splitter-Baseband #1	1
Harris	5320	SV-MN9S	Panel,Blank,1 RU	1
Harris	5330	MASV-NMA6Q	Grounding Shim,28RU	1
Harris	5340	MASV-NCN7R	Power Strip,110VAC,2X20A Brkr,2-Cbl,6Pos	2
Harris	5360	MASV-NCN1Z	Outlet Strip,110 VAC,UL Recognized	1
Harris	5370	SV-CL9T	Cable,Switch-Switch	1
Harris	5380	MASV-800M1	Station,MASTR V,P25T,800 MHz,799-817 Rx	1
Harris	5390	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	5400	SV-AW5R	Power Amplifier,Linear,800 MHz	1
Harris	5410	SV-RB3K	Busbar,HPA/PS,MASTR V	1
Harris	5420	MASV-NPS2P	Power Supply,110-240V,AC,MASTR V	1
Harris	5430	SV-SP2U	Programming,IP Simulcast	1
Harris	5440	SV-RB3A	Power Supply Shelf,2nd Position	1
Harris	5450	SV-CL9V	Kit,Cable,Ch #1,2,9,10,17,18 MASTR V IP	1
Harris	5460	MASV-NZN8R	Panel,Blank Module,MASTR V	7
Harris	5530	SC-VTXP25	MASTR V IP Simulcast,Tx Site,Comm Equip	1
Harris	5540	SCCL7D	Kit,Cable,Ethernet,5ft	1
Harris	5550	SCCF7X	Cable,RF Sensor,30ft	1
Harris	5560	MASC-NPS9T	Power Supply,120VAC,60Hz,12/24VDC	1
Harris	5570	MASC-NMR1H	Rack,Open,86 in(Xtra Dp) with support	1
Harris	5580	VSVS01	VS Prod Grp,Dummy Model Number	1
Harris	5590	VS-CR32	ROUTER,1921,AC,NO ENCRYPTION,CISCO	1

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Vendor	Item	Part Number	Description	Quantity
Harris	5600	VS-MN3E	KIT,MOUNTING HARDWARE,1921 ROUTER	1
Harris	5610	VSCU3H	Switch,Cisco 2960	3
Harris	5640	VSMA6N	KIT,MTG HDWR,CISCO 2960 MASTR III/V CAB	3
Harris	5670	VS-CU6G	MODULE,CISCO EHWIC-4ESG 4-PORT GIG INT	1
Harris	5680	SC-MD7A	Network Sentry,IP Simulcast	1
Harris	5690	AW-L1-PNMNM-50	Cable,GPS Antenna,50ft	1
Harris	5700	AW-L1-PNMNM-50	Cable,GPS Antenna,50ft	1
Harris	5710	SA-KRE1011217/02	ANTENNA,1574-1606 MHZ,WITH MOUNT	2
Harris	5720	PT-018602-001	Filter,Surge Protector,800-2500MHz	2
Harris	5730	MASV-800M1	Station,MASTR V,P25T,800 MHz,799-817 Rx	1
Harris	5740	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	5750	SV-AW5R	Power Amplifier,Linear,800 MHz	1
Harris	5760	SV-RB3K	Busbar,HPA/PS,MASTR V	1
Harris	5770	MASV-NPS2P	Power Supply,110-240V,AC,MASTR V	1
Harris	5780	SV-SP2U	Programming,IP Simulcast	1
Harris	5790	SV-RB3B	Power Supply Shelf,1st Position	1
Harris	5800	SV-CA5J	CABLE,DC POWER,48 IN	2
Harris	5820	SV-DW1B	Drawings,IP Simulcast/P25 Trunked	1
Harris	5830	SV-RB3G	Shelf,14-Slot,Open Rack	1
Harris	5840	SV-PM1C	Processor,Baseband Module,MASTR V	1
Harris	5850	MASV-NZN8S	Fan Tray,MASTR V	1
Harris	5860	SV-ZN9K	PANEL,XCONNECT,MASTR V	1
Harris	5870	SV-CL2D	Cable,Xconnect-Baseband Shelf #1	1
Harris	5880	SV-CL9V	Kit,Cable,Ch #1,2,9,10,17,18 MASTR V IP	1
Harris	5890	SV-CL9Z	Cable Assembly RF,RG223,BNC/SMA,4ft	1
Harris	5900	SV-MN9S	Panel,Blank,1 RU	1
Harris	5910	MASV-NMA6Q	Grounding Shim,28RU	1
Harris	5920	MASV-NCN7R	Power Strip,110VAC,2X20A Brkr,2-Cbl,6Pos	2
Harris	5940	MASV-NCN1Z	Outlet Strip,110 VAC,UL Recognized	1
Harris	5950	MASV-800M1	Station,MASTR V,P25T,800 MHz,799-817 Rx	1
Harris	5960	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	5970	SV-AW5R	Power Amplifier,Linear,800 MHz	1
Harris	5980	SV-RB3K	Busbar,HPA/PS,MASTR V	1
Harris	5990	MASV-NPS2P	Power Supply,110-240V,AC,MASTR V	1
Harris	6000	SV-SP2U	Programming,IP Simulcast	1
Harris	6010	SV-RB3A	Power Supply Shelf,2nd Position	1
Harris	6020	SV-CL9V	Kit,Cable,Ch #1,2,9,10,17,18 MASTR V IP	1
Harris	6030	MASV-800M1	Station,MASTR V,P25T,800 MHz,799-817 Rx	1
Harris	6040	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	6050	SV-AW5R	Power Amplifier,Linear,800 MHz	1

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Vendor	Item	Part Number	Description	Quantity
Harris	6060	SV-RB3K	Busbar,HPA/PS,MASTR V	1
Harris	6070	MASV-NPS2P	Power Supply,110-240V,AC,MASTR V	1
Harris	6080	SV-SP2U	Programming,IP Simulcast	1
Harris	6090	SV-RB3C	Power Supply Shelf	1
Harris	6100	SV-PM1C	Processor,Baseband Module,MASTR V	1
Harris	6110	SV-CL2D	Cable,Xconnect-Baseband Shelf #1	1
Harris	6120	SV-CL9W	Kit,Cable,Ch #3,4,11,12,19,20 MASTR V IP	1
Harris	6130	SV-CL2A	Cable Assembly RF,RG223,BNC/SMA,3ft	1
Harris	6140	MASV-800M1	Station,MASTR V,P25T,800 MHz,799-817 Rx	1
Harris	6150	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	6160	SV-AW5R	Power Amplifier,Linear,800 MHz	1
Harris	6170	SV-RB3K	Busbar,HPA/PS,MASTR V	1
Harris	6180	MASV-NPS2P	Power Supply,110-240V,AC,MASTR V	1
Harris	6190	SV-SP2U	Programming,IP Simulcast	1
Harris	6200	SV-RB3C	Power Supply Shelf	1
Harris	6210	SV-CL9W	Kit,Cable,Ch #3,4,11,12,19,20 MASTR V IP	1
Harris	6220	MASV-800M1	Station,MASTR V,P25T,800 MHz,799-817 Rx	1
Harris	6230	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	6240	SV-AW5R	Power Amplifier,Linear,800 MHz	1
Harris	6250	SV-RB3K	Busbar,HPA/PS,MASTR V	1
Harris	6260	MASV-NPS2P	Power Supply,110-240V,AC,MASTR V	1
Harris	6270	SV-SP2U	Programming,IP Simulcast	1
Harris	6280	SV-RB3C	Power Supply Shelf	1
Harris	6290	SV-CA5J	CABLE,DC POWER,48 IN	2
Harris	6310	SV-RB3G	Shelf,14-Slot,Open Rack	1
Harris	6320	SV-PM1C	Processor,Baseband Module,MASTR V	1
Harris	6330	SV-CL2E	Cable,Xconnect-Baseband Shelf #2	1
Harris	6340	SV-CL9X	Kit,Cable,Ch #5,6,13,14,21,22 MASTR V IP	1
Harris	6350	SV-CL9Z	Cable Assembly RF,RG223,BNC/SMA,4ft	1
Harris	6360	MASV-800M1	Station,MASTR V,P25T,800 MHz,799-817 Rx	1
Harris	6370	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	6380	SV-AW5R	Power Amplifier,Linear,800 MHz	1
Harris	6390	SV-RB3K	Busbar,HPA/PS,MASTR V	1
Harris	6400	MASV-NPS2P	Power Supply,110-240V,AC,MASTR V	1
Harris	6410	SV-SP2U	Programming,IP Simulcast	1
Harris	6420	SV-RB3C	Power Supply Shelf	1
Harris	6430	SV-CL9X	Kit,Cable,Ch #5,6,13,14,21,22 MASTR V IP	1
Harris	6440	MASV-800M1	Station,MASTR V,P25T,800 MHz,799-817 Rx	1
Harris	6450	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	6460	SV-AW5R	Power Amplifier,Linear,800 MHz	1

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Vendor	Item	Part Number	Description	Quantity
Harris	6470	SV-RB3K	Busbar,HPA/PS,MASTR V	1
Harris	6480	MASV-NPS2P	Power Supply,110-240V,AC,MASTR V	1
Harris	6490	SV-SP2U	Programming,IP Simulcast	1
Harris	6500	SV-RB3C	Power Supply Shelf	1
Harris	6510	SV-PM1C	Processor,Baseband Module,MASTR V	1
Harris	6520	SV-CL2E	Cable,Xconnect-Baseband Shelf #2	1
Harris	6530	SV-CL9Y	Kit,Cable,Ch #7,8,15,16,23,24 MASTR V IP	1
Harris	6540	SV-CL2A	Cable Assembly RF,RG223,BNC/SMA,3ft	1
Harris	6550	MASV-800M1	Station,MASTR V,P25T,800 MHz,799-817 Rx	1
Harris	6560	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	6570	SV-AW5R	Power Amplifier,Linear,800 MHz	1
Harris	6580	SV-RB3K	Busbar,HPA/PS,MASTR V	1
Harris	6590	MASV-NPS2P	Power Supply,110-240V,AC,MASTR V	1
Harris	6600	SV-SP2U	Programming,IP Simulcast	1
Harris	6610	SV-RB3C	Power Supply Shelf	1
Harris	6620	SV-CL9Y	Kit,Cable,Ch #7,8,15,16,23,24 MASTR V IP	1
Harris	6630	MASV-XXXXX	MASTR V,Dummy Model Number	1
Harris	6640	MASV-NMR1H	Rack,Open,86 in(Xtra Dp) with support	1
Harris	6650	SV-ZN9L	Panel,Splitter, Expansion Cabinet	1
Harris	6660	SV-CK1K	Cable,Freq ref,Cabinet to Cabinet,16 Ft	1
Harris	6670	SV-CL2F	Cables,Xconnect-Xconnect	1
Harris	6680	SV-CL2V	Cable,RF,RG223,BNC/SMA,20ft	2
Harris	6700	SV-CK1K	Cable,Freq ref,Cabinet to Cabinet,16 Ft	1
Harris	6710	MASV-NPS9T	Power Supply,120VAC,60Hz,12/24VDC	1
Harris	6720	MASV-800M1	Station,MASTR V,P25T,800 MHz,799-817 Rx	1
Harris	6730	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	6740	SV-AW5R	Power Amplifier,Linear,800 MHz	1
Harris	6750	SV-RB3K	Busbar,HPA/PS,MASTR V	1
Harris	6760	MASV-NPS2P	Power Supply,110-240V,AC,MASTR V	1
Harris	6770	SV-SP2U	Programming,IP Simulcast	1
Harris	6780	SV-RB3B	Power Supply Shelf,1st Position	1
Harris	6790	SV-CA5J	CABLE,DC POWER,48 IN	2
Harris	6810	SV-DW1B	Drawings,IP Simulcast/P25 Trunked	1
Harris	6820	SV-RB3G	Shelf,14-Slot,Open Rack	1
Harris	6830	SV-PM1C	Processor,Baseband Module,MASTR V	1
Harris	6940	SV-CL9T	Cable,Switch-Switch	1
Harris	6950	MASV-800M1	Station,MASTR V,P25T,800 MHz,799-817 Rx	1
Harris	6960	MASV-NSG9K	Feature,Software,P25 Phase 2	1
Harris	6970	SV-AW5R	Power Amplifier,Linear,800 MHz	1
Harris	6980	SV-RB3K	Busbar,HPA/PS,MASTR V	1

Vendor	Item	Part Number	Description	Quantity
Harris	6990	MASV-NPS2P	Power Supply,110-240V,AC,MASTR V	1
Harris	7000	SV-SP2U	Programming,IP Simulcast	1
Harris	7010	SV-RB3A	Power Supply Shelf,2nd Position	1
Harris	7020	SV-CL9V	Kit,Cable,Ch #1,2,9,10,17,18 MASTR V IP	1
Harris	7030	MASV-NZN8R	Panel,Blank Module,MASTR V	7
Harris	7160	MM100MS	MANUAL,PRODUCT,EDACS MIGRATION GATEWAY	1
Harris	7170	MS-DF2V	SERVER,EDACS MIGRATION GATEWAY	1
Harris	7180	MS-SG5H	LICENSE,MAX EDACS AD SITES	1
Harris	7190	MS-SG1R	LICENSE,IMC MAX SITE CHANNELS	8
Harris	7270	MS-SG1W	LICENSE,EMG TALKPATH,1-8	8
Harris	7350	MSCL1E	Cable Assembly,Ethernet,10ft	3
Harris	7380	MSDF1P	Switch,Cisco 2960,24 Port	1
Harris	7390	14031-0006-03	ADAPTER, USB TO RS-422	1
Harris	7400	NM-CU5H	MONITOR,19IN FLAT PANEL	1
Harris	7410	CA-010006-101	DATA CABLE, 100', EDACS MIGRATION GW	1
Harris	7420	VSSD04	LICENSE,SUMS,CORE	12
Harris	7430	SSSV1N	SERVICE,IMC UPGRADE FOR EMG	1
RFS		BMR-12	Various Patterns	9
RFS		SUB	Antenna Mounts various Tower	6
Polyphaser		IS-50	TX Combiner Surge Arrestor	6
Polyphaser		ISDC-50-24	TTA RX Surge Arrestor	9
DB Spectra		ATS8TMA3	TTA w 3 Mhz filter	3
DB Spectra		DBCNRX-24AC	Multicoupler	3
DB Spectra		DSCC85-10N	Combiner 10 Channel	3
Eupen		EC4-50-HF	1/2 Hi Flex cable	3000
Eupen		EC1-50-HF	1/4 HiFlex cable	3000
Eupen		NM50B12X	1/2 N Male for Hi Flex cable	112
Eupen		NM50B14X	1/4 N male Connector	90
Eupen		EC5-50A	7/8 Coaxial cable	1000
Eupen		NF50V78MA	7/8 connector	6
Eupen		EC7-50-A	1 5/8 Coaxial cable	400
Eupen		NF50V158MPA	1-5/8 Connectors N Female	2
Eupen		EC4-50-A	1/2 hard line	400
Eupen		NM50V12	1/2 connectors	24
Eupen		BH-158	1 5/8 Butterfly hangers	20
Eupen		BH-78	7/8 Butterfly hangers	20
Eupen		GK-S158	1 5/8 ground Kit	18
Eupen		GK-C78	7/8 ground Kit	12
Eupen		HG-158	Hoisting Grip	12
Eupen		HG-78	Hoisting Grip	8

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Vendor	Item	Part Number	Description	Quantity
Harris Spares		UD-ZN4Z	CONSOLE,SYMPHONY	1
Harris Spares		UD-AB1D	SINGLE FOOTSWITCH, USB, SYMPHONY	1
Harris Spares		UD-AB1A	SPEAKER, NANO, SYMPHONY	1
Harris Spares		UD-AB1M	DESK MIC, DB9	1
Harris Spares		UD-AB1B	JACK BOX, 6 WIRE	1
Harris Spares		EA-555012-001	Ethernet Switch Module,MASTR V	2
Harris Spares		EA-555011-001	Power Supply Module,110-240VAC,MASTR V	2
Harris Spares		EA-555014-012	Assembly,HPA MDl,Lin,851-870,100W,MASTRV	2
Harris Spares		EA-555005-001	Baseband Processor Module,MASTR V	2
Harris Spares		EA-555004-001	Traffic Control Module,MASTR V	2
Harris Spares		EA-555008-012	Transmit Module,851-870MHz,MASTR V	2
Harris Spares		EA-555007-011	Receiver Module,799-817MHz,MASTR V	2
Harris Spares		EA-555015-001	Assembly,Fan Tray,MASTR V	2
Harris Spares		VS-CR32	ROUTER,1921,AC,NO ENCRYPTION,CISCO	1
Harris Spares		VS-CR34	ROUTER,2921,AC,L3 SWITCH MDL,NO ENCRYPT	1
Harris Spares		MANG-NAA3E	Module,DVU,UAC,Interoperability Gateway	1
Harris Spares		MAMS-NAA3D	Module,GVIU,IP Gateway,P25	1
Harris Spares		OC-016344-001	Net Clock,Simulcast,MASTR V	1
Harris Spares		CP-MD7A	Network Sentry,IP Simulcast	1
MNI	Proteus MX Microwave Radio Terminals	J06PE1-0000-000--EM00	Proteus MX-Series Microwave Radio Terminal, 6 GHz, Full Indoor Radio, Hot Standby Protected, Gigabit Ethernet Ports, 6 Mbit/s in 2.5 MHz Channel	4
MNI	Proteus MX Microwave Radio Terminals	440F045D-XXX	Option, Software License Key for Total Throughput of 45 Mb/s	
MNI	Proteus MX Microwave Radio Terminals	440F155F-XXX	Option, Software License Key for Total Throughput of 155 Mb/s (2 keys required per HSB radio)	8
MNI	Proteus MX Microwave Radio Terminals	8000754-00	Data Card, 32E1/DS1, MX	8
MNI	Proteus MX Microwave Radio Terminals	9900464-00	Telect, ELF-0000-2400, 1RU Shelf	3
MNI	Proteus MX Microwave	9901587-00	Telect, ELF-1008-1800, 8-Port, DSX1 RJ45 Module	8

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COMMUNICATIONS INTERNATIONAL

Vendor	Item	Part Number	Description	Quantity
MNI	Radio Terminals Proteus MX Microwave Radio Terminals	9901481-00	Telect, ELF-0000-0001, Faceplate	6
MNI	Proteus MX Microwave Radio Terminals	DS0401000006	Telect, Patch Cable 72" Bantham	
MNI	Proteus MX Microwave Radio Terminals	8108760-10	CHAMP Connector 24 GA Cable, AMT-MX, 32 E1/DS1 (2 cables required), 10' (3m)	8
MNI	Proteus MX Microwave Radio Terminals	8708290-DXX	Waveguide Extender Kit, 6 GHz, HSB	4
MNI	Proteus MX Microwave Radio Terminals	8708304-00	Speakerphone Rack Shelf Kit w/ Phone	3
MNI	Proteus MX Microwave Radio Terminals	8209325-02	7' x 19" EIA Rack and Mount Radio	3
MNI	Proteus MX Microwave Radio Terminals	9900653-00	Fuse Panel, +/-48/24V	3
MNI Spares	Proteus MX Microwave Radio Terminals	649-010-60025-0010-16	RFU RR1 Transceiver Module, Wideband, MX, 6 GHz (Includes Power Supply Unit)	2
MNI Spares	Proteus MX Microwave Radio Terminals	8209345-05	Channel Unit, Standard Power Supply, MicroBus Option installed	2
Eltek	1	CTOS0201.001	FPS 48V 2kW 230VAC BD; Equipped with rect and breakers	1
Eltek	2	BR1923-1U	19" TO 23" 1RU ADAPTOR BRACKET KIT	1
Eltek	3	503833	NON-SEISMIC RELAY RACK 23"WIDE 7' HIGH	1
Eltek	4	504880	BATTERY TRAY, 23"	1

COMMUNICATIONS INTERNATIONAL

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Vendor	Item	Part Number	Description	Quantity
Eltek	5	BP10010060000	SEE GENERIC CABLE DRAWING	1
Eltek	6	YAV6CL2TC38FX	LUG #6 FLEX, 2H, 1.0" CC, 3/8" STUD	2
Eltek	7	208729	1/4 BLUE 2H RING LUG #6 AWG	2
Eltek	8	4/0 DLO CABLE	Cable, 4/0 AWG DLO, Black	75
Eltek	9	2634037102	3/8 YELLOW 2H RING LUG 4/0 AWG	6
Eltek	10	HSC100FR	Heat Shrink, Clear, 1/0AWG-4/0 AWG	6
Eltek	11	THHN-4/0-STR-GRN	Cable, 4/0 AWG THHN, Green	15
Eltek	12	2633035102	3/8 PURPLE 2H RING LUG 4/0 AWG	1
Eltek	13	YH3434	H-Tap, 350-4/0 to 350-4/0	1
Eltek	14	CFO-FR	H-Tap Cover, YH2C2C	1
Eltek	15	FGK-6-10	Frame Ground Kit, 10' #6 GRN	1
Eltek	16	500773	M12V155FT-GNB	1
Eltek	18	294538	CIRCUIT BREAKER, 5 AMP B-FRAME	2
Eltek	19	294539	CIRCUIT BREAKER, 10 AMP B-FRAME	1
Alcatel		3HE02773AA	7705 SAR-8 CHASSIS	2
Alcatel		3HE02778AB	7705 SAR-8 FAN	2
Alcatel		3HE02774AA	7705 SAR-8 CONTROL SWITCH MODULE	2
Alcatel		3HE02775AB	7705 SAR-8 16 PORT T1/E1 ASAP CARD	2
Alcatel		3HE02776AB	7705 SAR-8 8 PORT GE/FE ETHERNET CARD V2 w SFP	4
Alcatel		3HE03397AA	16 PORT ASAP INTERFACE CABLES	2
Alcatel		3HE03400CA	7705 SAR-8- POWER CABLE REDUNDANT	2
Alcatel		3HE03394AA	32 PORT T1/E1 RJ 45 Panel	2
Alcatel		3HE00028CA	1 Port SFP Optics Module SM 1310nm LC	4
Alcatel		3HE02784EA	7705 SAR-8 RELEASE 5.0 OS LICENSE	2
Cablesforless		**SKU#119-505**	**5 Meter LC to LC Duplex SM Fiber Optic Jumper**	4

COMMUNICATIONS
INTERNATIONAL

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EQUIPMENT BROCHURES

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The Interoperability Gateway

- Is a multi-channel analog voice interface for OpenSky®, NetworkFirst®, and P25^{IP} packet-switched digital networks
- Supports up to 12 audio channels
- Connects existing analog equipment to the Internet Protocol digital network

The Interoperability Gateway is a software-based multi-channel codec module designed to interface the IP digital network with analog equipment. Applications include connection to dispatch console equipment and to analog voice base station equipment. In both cases, control of the Interoperability Gateway is implemented in software and may be customized easily for specific requirements.

Dispatch Console Interface
Each Interoperability Gateway receives and transmits packetized digital voice over an Ethernet interface for connection through a switch to the Voice, Interoperability, Data, and Access (VIDA®) network.

Interoperability Gateway modules offer a 4-wire balanced line level interface for the audio connection. Audio amplitude may be adjusted under software control, and signaling lines are opto-isolated and may be

operated in "open collector" mode.

Interoperability
When used to provide interoperability with other communications systems, network users are automatically connected to legacy system users by selecting them as designated voice groups. This provides capabilities for cross-band inter-system operation.

Additionally, the Interoperability Gateway supports the MDC-1200 signaling format for User ID and Emergency functions.

Digital Voice Coding
Digitized voice within the digital network is coded using Advanced Multiband Excitation (AMBE®) for OpenSky systems or Improved Multiband Excitation (IMBE™) for P25 systems. AMBE/IMBE digital voice is then encapsulated into IP packets and sent along with control messages into the IP digital network.

Additionally, the Interoperability Gateway supports the use of Adaptive Differential Pulse-Code Modulation (ADPCM) for NetworkFirst systems and transmission of analog inputs to other VIDA products which support ADPCM, such as the C3 Maestro$^{IP™}$ and V^{IP} Consoles.

Hardware Design
The Interoperability Gateway is a rack-mounted card cage designed to accept multiple VME circuit cards. It contains redundant integrated power supplies and provides forced ventilation for up to 3 Interoperability Gateway cards. Each card provides 4 audio interfaces for a total of 12 interfaces per chassis.

The Interoperability Gateway uses a VME-based backplane design for power and signal routing, and offers rear mounting expansion slots for additional interface expansion.

OpenSky

Harris' OpenSky Wireless Private Network is a fully interoperable digital trunked communications network for public safety, utility, federal, transit, and industrial markets. OpenSky is a complete end-to-end Voice over Internet Protocol (VoIP) solution and employs packet technology to provide integrated voice and data. The OpenSky radio network is the only private land mobile radio communications system that provides clean integration of data messaging with trunked digital voice on the same RF channel. Integrated voice and data over Time Division Multiple Access (TDMA) allows users to perform multiple communication functions at the same time on one radio. The use of TDMA quadruples call capacity by allowing four simultaneous voice calls per 25 kHz channel.

NetworkFirst

Public safety communications in today's world face unprecedented challenges. More than ever, Homeland Security and Situation Readiness depend heavily on effective communication among federal, state, county, and local agencies. Harris' NetworkFirst answers the call for an emergency communications network that provides local, regional, state, and even nationwide connectivity. NetworkFirst uses cost-effective Internet Protocol (IP) packet switched technologies to provide a fast, cost-effective means of achieving multi-agency interoperability, regardless of radio type, frequency, or mode. NetworkFirst creates the most technologically advanced permanent communications network available in the industry today, providing a technology backbone that is extremely flexible, allowing communications requirements to expand – without a wholesale system changeout.

P25^{IP}

Harris' P25^{IP} (P25 to the power of IP) is the first completely Internet Protocol (IP)-based conventional mobile radio communications system developed for users requiring the secure digital voice and data capabilities of Project 25 (P25). P25^{IP} is part of a portfolio of solutions that Harris offers for wide-area communication systems – each of which is capable of meeting the communications requirements of public safety, public service and first responders. Within the Harris portfolio, the P25^{IP} network provides an excellent fit for those agencies which have lower user densities (few users covering larger geographic areas) but still require feature-rich secure voice and data communications. P25^{IP} is also particularly appropriate for users operating with non-exclusive VHF and UHF frequencies. For federal users, P25^{IP} meets the Congressional and NTIA mandates for the narrowband (12.5 kHz) migration.

General Specifications

Dimensions (H x W x D): 3.5 x 19.0 x 14.75 in.
8.9 x 48.3 x 37.5 cm
Rack: Standard 19 inch, 2 rack units high
Total Card Slots: 4
Weight: Approximately 13 pounds
(5.9 kilograms)

Interoperability Gateway Codec Module
   With analog base station interoperability supporting the OpenSky, P25^{IP}, and ADPCM vocoders

Connectors

DB-15:	Isolated audio in/out and Tx/Rx signaling
RJ45:	Ethernet interface
USB:	Command line/monitoring
Status LEDs:	DSP, clock, power, interface, network

Audio

Audio I/O:	Balanced transformer isolated
Line Impedance:	600/10K ohm selectable
Nominal Input Range:	-25 to 12 dBm
Nominal Output Range:	-25 to +10 dBm
Frequency Response:	300 Hz to 3.5 kHz $\pm$ 3.5 dB

Communications

Ethernet:	IEEE 802.3 compliant (10 Base-T and 100 Base-X)
USB:	38.4 kbps, ASCII ANSI-compliant terminal

Interoperability Gateway Chassis Interface

Backplane Connectors:	VME
AC Power Module:	85 to 264 VAC (115-230 VAC nominal), 47-63 Hz
DC Power Module:	-36 to -72 VDC (-48 VDC nominal)
Current Consumption:	10A maximum
Cooling:	Redundant forced air with exhaust at rear of chassis

Environmental
   Operating Temperature:
      -4 to +140°F (-20 to +60°C)
   Storage Temperature:
      -4 to +185°F (-20 to +85°C)
   Humidity:
      Not to exceed 95% and relative humidity at 122°F (+50°C)

MASTR® V
IP SIMULCAST
A TRUE SIMULCAST DIFFERENTIATOR

VERSATILE, EFFICIENT P25 DESIGN

Since the MASTR V IP Simulcast System simultaneously repeats the same radio signal from multiple geographic locations at the same time, deploying an IP Simulcast System can significantly reduce the number of required physical sites.

The MASTR V IP Simulcast System provides an end-to-end all-digital system based on the proven MASTR V hardware platform. The system is composed of a MASTR V IP Control Point, MASTR V Transmit sites, and optional MASTR V Auxiliary Receiver sites.

Highlights of this new system include

> Software Upgradeable to P25 Phase 2 (TDMA)
> Standardized MASTR V platform
> Reduction in equipment and required floor space
> Remote capability for timing, setup, and alignment verification
> VIDA network-based Information Assurance support
> Fully operational over IP using the VIDA network
> Single control point manages up to 17 Transmit sites and up to 24 channels

Standardized MASTR V platform:

> VIDA Network Sentry for status and alarming
> Mini-mobility Exchange (MME) data handling
> Redundant GPS time base receivers
> Optional Intrusion Detection System
> Redundant Ethernet Switches
> Router for connectivity to VIDA network
> MASTR V Control Shelf and Modules
> Power Supply Units (115 VAC or -48 VDC)
> Linear Mode Transmitters for improved RF system performance

WIDE-AREA COVERAGE

MASTR V IP Simulcast Systems provide a solution for wide-area coverage demands and enhances communications in situations where the size of the desired coverage area is too large for one centralized transmitter location and there is a need to provide coverage to multiple agencies in a common territory.

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GENERAL SPECIFICATIONS

Size (Base Station):
4 channels per 5 Rack Unit Shelf

Rack Dimensions (H x W x D):
83.0 x 23.1 x 21.0 in.
(211 x 59 x 53 cm)
69.1 x 23.1 x 21.0 in.
(175 x 59 x 53 cm)

Power:
90-230 VAC or -48 VDC

Ambient Temperature Range:
-22 to +140°F
(-30 to +60°C)

Humidity:
90% @ 122°F (+50°C)

Altitude:
Operational: Up to 15,000 ft
(4,572 m)
Shippable: Up to 50,000 ft
(15,240 m)

HARRIS®

Public Safety and Professional Communications
221 Jefferson Ridge Parkway
Lynchburg, VA 24501 USA

1-800-368-3277 (+1-434-455-6403)

www.pspc.harris.com

PROVEN MASTR V PLATFORM

TRANSMITTER

	VHF	UHF	700	800
Frequency Range (MHz):	150-174	380-400	764-776	851-870
Rated Power Output (W):	100	100	100	100
RF Output Impedance (ohm):	50	50	50	50
Conducted Spurious and Harmonic Emission (dB):	<86	<86	<70	<70
Frequency Stability (ppm):	<0.1	<0.1	<0.1	<0.1
Channel Spacing (kHz):	12.5	12.5	12.5	12.5
Synthesizer Step Size (kHz):	1.25	1.25	6.25	6.25

RECEIVER

	VHF	UHF	700	800
Frequency Range (MHz):	150-174	380-400	799-817	806-824
Sensitivity, TIA-P25 (dBm):	<-118	<-118	<-119	<-119
RF Input Impedance(ohm):	50	50	50	50
Intermodulation Rejection, TIA-P25 (dB):	<80	<80	<80	<80
Spurious Response/Image Rejection (dB):	<90/<100	<90/<100	<90/<100	<90/<100
Frequency Stability (ppm):	<0.1	<0.1	<0.1	<0.1
Channel Spacing (kHz):	12.5	12.5	12.5	12.5
Synthesizer Step Size (kHz):	1.25	1.25	6.25	6.25

OPERATIONAL MODES

MODE	MODULATION	EMISSION DESIGNATOR
P25 Phase 1	C4FM	8K00F1D
P25 Linear Simulcast	WCQPSK	9K70D1W
P25 Phase 2	HDQPSK	9K80D7W

REGULATORY DATA

FREQUENCY RANGE (MHZ)	POWER OUTPUT (ADJUSTABLE) (W)	FCC TYPE ACCEPTANCE NUMBER	APPLICABLE FCC RULES	INDUSTRY CANADA CERTIFICATION NUMBER	APPLICABLE INDUSTRY CANADA RULES
150-174	10-100	OWDTR-065-E	90	3636B-0065	RSS-119
380-400	10-100	NA	NA	NA	NA
764-776	10-100	OWDTR-057-E	90	3636B-0057	RSS-119
851-869	10-100	OWDTR-053-E	90	3636B-0053	RSS-119

Technical specifications are subject to change without notice. Product sales are subject to applicable U.S. export control laws.

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Network Switching Center (NSC)

The Network Switching Center consists of a tiered core of switching and management applications based on Internet Protocol (IP). These applications

- Manage the routing of voice and data to mobile subscribers

- Employ commercial off-the-shelf equipment

- Include optional local and geographically separated high-availability configurations

The Network Switching Center (NSC) is the heart of the OpenSky®/ NetworkFirst®/P25^{IP} packet-switched network. It is scalable to meet the needs of every network, from small rural networks up to large county and statewide networks. The Network Switching Center manages the hardware and software components of the network, and routes calls among users and standard LAN/WAN networking equipment. All of the components in the Network Switching Center are commercial off-the-shelf (COTS) computer and networking equipment that leverage the Internet Protocol (IP) industry. Additionally, the Interoperability Gateway, which provides connection points to analog devices, can be centrally located with the NSC equipment.

Management and Administration
The NSC includes two management and administration applications: the Regional Network Manager (RNM) and the Unified Administration System (UAS). The RNM provides management support for the various hardware and software components that make up the network. It identifies faults, provides audible alerts, and reconfigures system components to maintain continuous operations. The UAS provides the capability to define and structure the systems, sites, talkgroups, users, and other resources.

Call Routing
Through its call routing applications, the NSC routes calls to and from each

voice group or mobile data user on a real-time basis. It regulates voice and data traffic on the network. Each voice user belongs to a voice group of peers. A network administrator assigns the members of a voice group and sets the voice group parameters including priority, hang time, preferred site, and response time. The NSC maintains these voice group files. The NSC routes the IP voice traffic of one member to all the other members of a given voice group.

Interoperability Gateway
The Interoperability Gateway provides interfaces to other mobile radio technologies through 4-wire analog interfaces. Voice calls are routed between OpenSky/NetworkFirst/P25^{IP} users and the Interoperability Gateway by the NSC as necessary.

Network Topology
The topology of a network is divided into autonomous regions, which are further divided into cells. Each cell contains a collection point to allow groups of audio sources entry into the system. At a higher level, each region contains a Network Switching Center which handles the voice and network control traffic between cells within and among regions.

The Network Switching Center can be configured with fully redundant hardware and software operating in a high-availability configuration to ensure the continuous network operation required in mission-critical applications.

The redundant configuration may be situated in a different geographic location. The NSC call routing applications are hosted on a Dell™ server that is physically linked to a backup system containing redundant hardware and software configurations for emergency or troubleshooting purposes. The management and administration applications also reside on a Dell server. Multiple PC clients can be attached to the NSC for remote access and control.

Optional NSS Components
For P25^{IP} systems, the NSC may contain two additional applications, depending upon the customer's requirements.

- The Regional Site Manager Pro (RSM Pro) provides database reporting to RF sites and a powerful Activity Warehouse application, allowing users to run customized reports on system, group, and user activity. The RSM Pro also houses the Device Manager software used to remotely configure and manage most VIDA® Network devices.

- The Network Key Management Facility (KMF) provides encryption keys throughout the P25 system and facilitates Over-the-Air Reprogramming (OTAR).

OpenSky

Harris' OpenSky Wireless Private Network is a fully interoperable digital trunked communications network for public safety, utility, federal, transit, and industrial markets. OpenSky is a complete end-to-end Voice over Internet Protocol (VoIP) solution and employs packet technology to provide integrated voice and data. The OpenSky radio network is the only private land mobile radio communications system that provides clean integration of data messaging with trunked digital voice on the same RF channel. Integrated voice and data over Time Division Multiple Access (TDMA) allows users to perform multiple communication functions at the same time on one radio. The use of TDMA quadruples call capacity by allowing four simultaneous voice calls per 25 kHz channel.

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P25^{IP}

Harris' P25^{IP} (P25 to the power of IP) is the first completely Internet Protocol (IP)-based conventional mobile radio communications system developed for users requiring the secure digital voice and data capabilities of Project 25 (P25). P25^{IP} is part of a portfolio of solutions that Harris offers for wide-area communication systems – each of which is capable of meeting the communications requirements of public safety, public service and first responders. Within the Harris portfolio, the P25^{IP} network provides an excellent fit for those agencies which have lower user densities (few users covering larger geographic areas) but still require feature-rich secure voice and data communications. P25^{IP} is also particularly appropriate for users operating with non-exclusive VHF and UHF frequencies. For federal users, P25^{IP} meets the Congressional and NTIA mandates for the narrowband (12.5 kHz) migration.

General Specifications

Refer to the individual product data sheets for specifications.

- Regional Management Server – ECR-8034

- Centralized Site Manager, Regional Site Manager Professional, Regional Site Manager – ECR-8038

- Interoperability Gateway – ECR-7054

- VIDA Network Management – ECR-8030

READY FOR THE NEXT GENERATION DISPATCH CONSOLE

POWERFUL, RELIABLE COMMUNICATIONS

The Symphony Dispatch Platform provides high-performance computing and graphics capability to support 24-hour mission-critical dispatch operations. The completely solid-state design affords the high reliability needed for dependable communications in emergencies. The Symphony Dispatch Platform uses digital audio technology to provide end-to-end secure communications that are free from unauthorized access.

With its advanced features, the Symphony Dispatch Platform allows dispatchers to communicate efficiently and clearly with first responders to improve response times. Symphony provides dispatchers complete control to adapt as their priorities and needs change.

Highlights of this new platform include

> Scalability for easy upgrades

> Flexible and simple mechanical configuration (mount in a rack, mount under a desk, or use as a desktop unit)

> Vibration resistant

> Remote configuration capability

> End-to-end voice encryption for secure communications

> Superior life-cycle management

> Support for trunked and conventional operation

> Ability to run the existing C3 Maestro^{IP}™ application or the new Symphony application

> Silent operation with no moving components

GENERAL SPECIFICATIONS

Processor Type:
Intel® Core™ i7 Ivy Bridge processor

Operating System:
Windows® 8 Professional 64-bit
Windows 7 Ultimate 32-bit

Typical Dimensions (H x W x D):
Computer:
16.5 x 11.7 x 1.75 in.
(42 x 30 x 4.5 cm)
Display:
Touchscreen capable from 19 to 48 inches

Power:
85-264 VAC, 47-63 Hz input

Operating Temperature:
+32 to +104°F
(0 to +40°C)

Storage Temperature:
-22 to +185°F
(-30 to +85°C)

MTBF
10 years

RoHS Compliant

UL Certified

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Public Safety and Professional Communications
221 Jefferson Ridge Parkway
Lynchburg, VA 24501 USA

1-800-368-3277 (+1-434-455-6403)

www.pspc.harris.com

RUGGED AND SCALABLE PLATFORM*

ENCLOSURE

19-inch rack mount compatible metal enclosure

1U (1.75 in.) height

Front panel display, connections, and controls for:

>	Power	>	2.0 USB
>	Display Port	>	Solid-State Hard Drive
>	Auxiliary Audio Input	>	Backup Radio switch
>	Auxiliary Audio Output		

EXTERNAL INTERFACE

Two 10/100/1000 Gigabit Ethernet ports with RJ45

USB 2.0 ports (excluding Audio Subsystem)

6 Digital outputs

5 Solid-State relay outputs

AUDIO SUBSYSTEM

One 10/100 DSP-driven Ethernet Extender Interface with RJ45 connector

Analog Operator Headset interfaces via DB-9F connector on rear panel

USB Operator Headset interface via USB Type A connector on rear panel

USB Operator Footswitch interface via USB Type A connector on rear panel

Analog Supervisor Headset interface via DB-9F connector on rear panel

USB Supervisor Headset interface via USB Type A connector on rear panel

USB Supervisor Footswitch interface via USB Type A connector on rear panel

Analog Desk/Gooseneck Microphone interface via DB-9F connector on rear panel

USB Desk Microphone interface via USB Type A connector on rear panel

Two additional spare USB 1.1 ports via USB Type A connectors on rear panel

Analog Paging Encoder interface via RJ45 connector on rear panel

8-channel Analog Speaker interface with 1/4-inch TRS jacks on rear panel for audio connections

Analog Recorder interface via RJ45 connector on rear panel

Analog Call Director interface via RJ45 connector on rear panel

Analog Backup Radio interface via DB-9 Male connector on rear panel and mode selection switch mounted on front panel

Analog Building Intercom interface via RJ45 connector on rear panel

2 Auxiliary Audio Inputs via 3.5-mm TRS jack on rear panel

2 Auxiliary Ethernet DSP Extender ports on rear panel

VIDEO

Two Display ports (can drive up to 4 monitors)

STORAGE

64 GB extended temperature SATA interface solid-state drive

Externally accessible and removable via front panel

*Requires System Release SR10A or newer and C3 Maestro^IP software code R7B.

Technical specifications are subject to change without notice. Product sales are subject to applicable U.S. export control laws.

PRODUCT PERFORMANCE NOTE: THE PERFORMANCE OF ANY HARRIS CONSOLE (SYMPHONY DISPATCH CONSOLE) WITH ANY THIRD-PARTY HARDWARE (INCLUDING COMPUTERS) OTHER THAN HARRIS RECOMMENDED OR APPROVED HARDWARE IS NOT GUARANTEED BY HARRIS CORPORATION NOR WILL HARRIS CORPORATION OFFER ANY SOFTWARE OR OTHER CORRECTIONS TO IMPROVE THE PERFORMANCE OF THE HARRIS CONSOLE WITH SUCH THIRD-PARTY HARDWARE.

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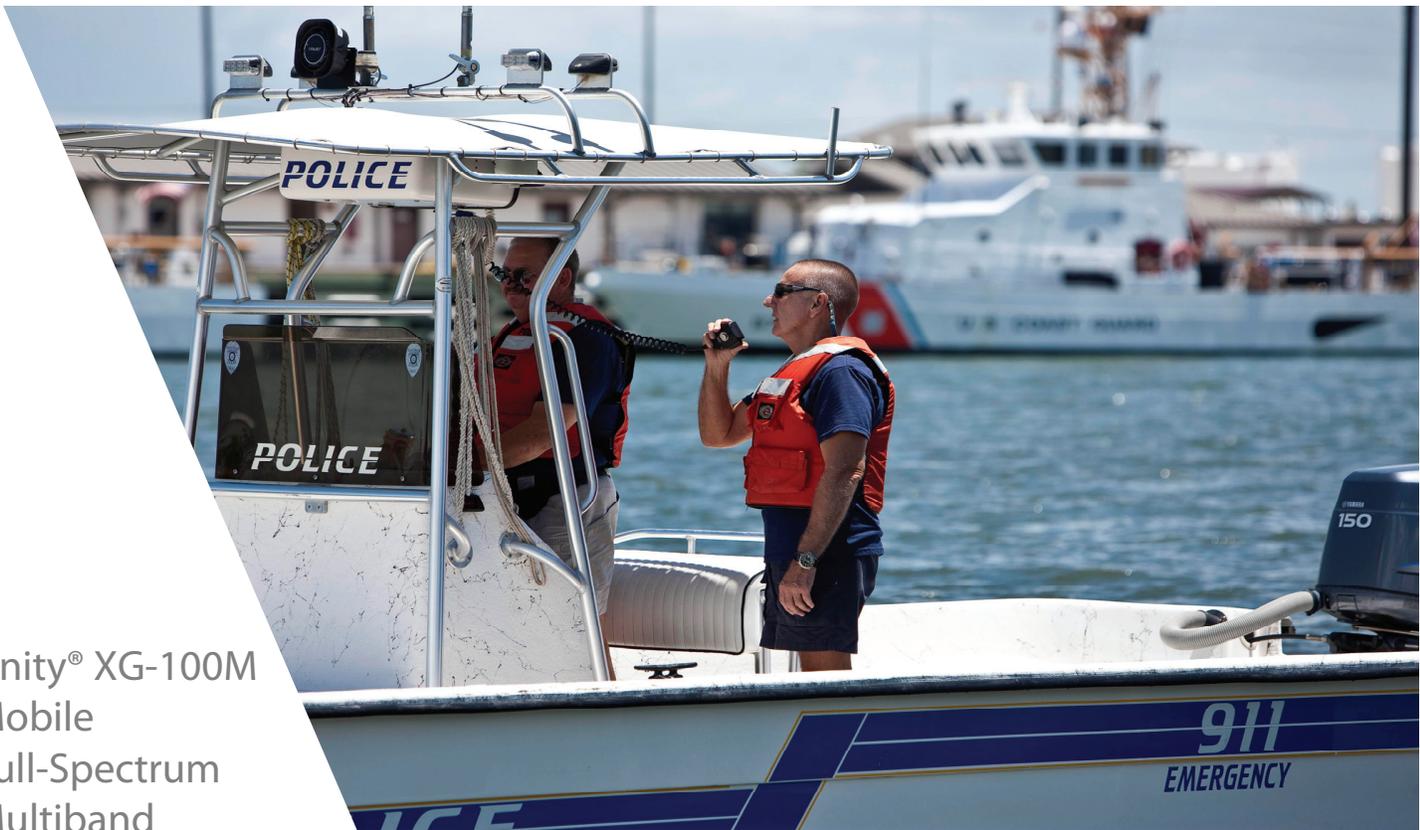
Unity® XG-100M
Mobile
Full-Spectrum
Multiband

ULTIMATE PERFORMANCE IN ONE RADIO

Unity XG-100M: The Truly Interoperable Solution for P25 Multiband Performance

The Unity XG-100M full-spectrum multiband radio's user-centric design delivers unprecedented interoperability, ease of use, and advanced capabilities in a radio that users can depend on for years to come. By supporting both digital APCO P25 secure and analog FM communications across the VHF, UHF, and 700/800 MHz bands in a single radio, responders can communicate with multiple jurisdictions and agencies operating on multiple frequencies and systems. In addition, the XG-100M supports Harris' Enhanced Digital Access Communications System (EDACS®) and ProVoice™ 800 MHz trunking and the receipt of Low Band VHF (30-50 MHz) frequencies. Designed to scan continuously across all bands, voice modes, and encryption types, the XG-100M provides users exceptional capability and interoperability in a rugged radio that meets the requirements of mission-critical communications. An optional vehicular repeater is available to extend network connectivity for portable radios and provide added user safety.

Standard features found on the Unity XG-100M include:

> AMBE+2™ Vocoder – provides noise cancellation capability and enhances audio quality

> Active Noise Cancellation – with built-in microphone that combines with the hand held microphone to suppress noise

> Built-in GPS – for position tracking and rapid response for emergencies

> Rugged for Field Use – built to exceed MIL-STD-810G for durability

Built upon Harris' long history of fielding mission-critical software-defined radios that support evolving customer requirements through software-only upgrades, the Unity XG-100M allows flexibility for future growth.

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FUTURE READY

The Unity XG-100M is an investment that agencies can rely on as transitions occur to P25 technology. The mobile supports P25 conventional and trunked operation, wideband and narrowband channels, and its software-defined architecture allows field upgrading to operating modes such as P25 Phase 2. With a 3-year standard radio warranty, the Unity XG-100M is a future-proof investment.

SUPERIOR AUDIO EXPERIENCE

Using the CH-100 control unit, the XG-100M features Harris' proprietary noise suppression capability to provide clear and crisp voice quality in high-noise environments. The CH-100 is designed with a built-in microphone and advanced signal processing technology that work with the hand held microphone for built-in noise suppression. The AMBE+2 vocoder optimizes the quality of communications and controls distortions to provide one of the best audio experiences available.

NEXT-GENERATION USER INTERFACE

The user-centric design of the XG-100M with the CH-100 control unit offers significant capability and flexibility beyond push-to-talk:

> Large full-color display with resistive touch control
> Intuitive menu-driven graphical user interface
> Menu color coding to assist user operation
> Large knobs and buttons for channel select, volume control, and emergency calls
> Front-panel programming

ADVANCED FEATURES

The XG-100M delivers the advanced features required by critical communication users.

> Multiple Mixed Systems Zones allows users to communicate across multiple types of systems: analog conventional, P25 trunked, and P25 conventional. Zones composed of multiple systems are created and users can assign knob positions to channels and talkgroups on these disparate systems.
> Command Tactical Zone allows users to create custom zones to communicate with radios not part of preset zones, regardless of frequency and with no need for programming through computer interfaces. Custom zones provide up to 48 additional channel assignments.
> GPS provides quick and accurate unit location information to dispatchers via the radio network.

ACCESSORIES

The XG-100M operates with a full complement of Harris accessories. Several control units are highlighted below. All are available in front or remote mount designs.

The CH-100 control unit incorporates a large 4.3-inch touchscreen color display that includes a powerful graphical user interface and a built-in microphone that works with the hand held microphone to support noise suppression. Wireless audio accessories for the CH-100 are supported by Bluetooth® technology. For security purposes, pairing management is controlled from the radio interface, and Bluetooth can be disabled, if desired.

The CH-721 control unit is a more traditional unit with a 3-line 12-character alphanumeric display. The control unit is available in Scan (limited keypad) or System (full keypad) models and supports 800 MHz EDACS and ProVoice trunking operation. The Scan model has large menu selection buttons. The System model has a 12-button keypad to allow advanced operations without the need for a DTMF microphone. The front panel also has an ambient light sensor for automatic display dimming.

The HHC-731 Hand Held Controller provides the advanced features of the CH-721 System control unit, including siren and light bar control, in a compact package. The ruggedized design meets a full range of environmental specifications and supports 800 MHz EDACS and ProVoice trunking operation. The 3-line 12-character alphanumeric display is backlit for use in low-light areas. The small size of the HHC-731 makes it ideal for covert operations and use in space-constrained environments.

GENERAL SPECIFICATIONS

Dimensions (H x W x D):

Radio Only (50W):
2.0 x 6.9 x 9.7 in.
(50 x 175 x 247 mm)

RU and CH-721 CU
(Includes Knobs):
2.4 x 6.9 x 12.8 in.
(60 x 175 x 325 mm)

CH-721 CU (Remote):
2.4 x 7.0 x 4.0 in.
(60 x 175 x 100 mm)

RU and CH-100 CU
(Includes Knobs):
3.3 x 7.0 x 11.6 in.
(84 x 178 x 295 mm)

CH-100 CU (Remote):
3.3 x 7.0 x 2.8 in.
(84 x 178 x 71 mm)

System Voltage:
10.8 to 16.6 VDC Negative Ground

Operating Temperature Range:
-22 to +140°F (-30 to +60°C)

Relative Humidity:
Per MIL-STD-810G

Altitude:

| Operational: | 15,000 ft (4,572 m) |
| In Transit: | 40,000 ft (12,192 m) |

Channel/Talkgroup Capacity:
CH-100: 12,500 (1,250 per mission plan)
CH-721: 1,250

Speaker:
External, 15W

Control Unit Options

CH-100: Touchscreen, 16-bit color, 480 pixels x 272 pixels, 4.3 in., sunlight readable LCD

CH-721: System and Scan models available, 3-line 12-character alphanumeric display

HHC-731: Ruggedized and compact design, provides CH-721 features, 3-line 12-character alphanumeric display

Options and Accessories

Remote and front mount kits, hand held controller, mobile mic, DTMF mic, desk mic, desktop control station, and vehicular repeater

N24862

EXCEPTIONAL OPERATION FOR CRITICAL COMMUNICATIONS

TRANSMITTER

TYPICAL PERFORMANCE SPECIFICATIONS	FULL-SPECTRUM MULTIBAND*
Frequency Range (MHz):	136-174 (VHF), 380-520 (UHF), 762-870 (700/800)
Rated RF Power (W):	VHF: 5-50, UHF: 5-50, 700: 2-30, 800: 2-35
Rated RF Power Talkaround (W):	VHF: 5-50, UHF: 5-50, 700: 2-30, 800: 2-35
Frequency Stability (-30 to +60°C) (ppm):	±0.5
Modulation Limiting (kHz):	2.5, 4, 5 (FM)
Audio Response (dB):	+1/-3
Spurious and Harmonics (dBc):	-70, FCC Part 90
FM Hum and Noise @ 25 kHz (dB):	VHF-low : 48.2, VHF: 48.8, UHF: 48.6, 700/800: 48.0
@ 12.5 kHz (dB):	VHF-low : 47.1, VHF: 45.9, UHF: 46.2, 700/800: 44.4
Audio Distortion (%):	<1.0
Project 25 Modulation Fidelity (%):	<1.00
Project 25 Adjacent Channel Power (dBc):	>70
Emission Designators:	11K0F3E, 8K4F1E, 8K4F1D, 12K00G1E, 12K00G1D, 14K0F3E

*VHF product is compliant with applicable FCC narrowbanding mandate below 512 MHz.

RECEIVER

TYPICAL PERFORMANCE SPECIFICATIONS	FULL-SPECTRUM MULTIBAND*
Frequency Range (MHz):	30-50 (VHF low), 136-174 (VHF), 380-520 (UHF), 762-870 (700/800)
Channel Spacing (kHz):	12.5, 20, 25
Sensitivity (12 dB SINAD) (dBm):	VHF-low: -121.5, VHF:-122.1, UHF: -121.8, 700/800:121.2
P25 Reference Sensitivity (5% BER) (dBm):	VHF-low: -121.5, VHF:-122.1, UHF: -121.8, 700/800:121.2
Adjacent Channel Rejection @ 25 kHz (dB):	VHF-low : 80.6, VHF: 82.5, UHF: 77.4, 700/800: 77.0
P25 Adjacent Channel Rejection @ 12.5 kHz (dB):	VHF: 63.9, UHF: 62.9, 700/800: 61.9
Intermodulation (dB):	VHF-low : 81.9, VHF: 81.9, UHF: 81.8, 700/800: 82.5
Spurious and Image Rejection (dB):	VHF-low : 86.6, VHF: 83.0, UHF: 92.4, 700/800: 94.4
FM Hum and Noise @ 25 kHz (dB):	VHF-low : 49.5, VHF: 54.8, UHF: 48.2, 700/800: 52.0
@ 12.5 kHz (dB):	VHF-low : 46.6, VHF: 54.6, UHF: 45.0, 700/800: 44.9
Rated Speaker Audio Output Power (W):	15W RMS into 4 ohm
Audio Distortion (%):	<1.0 @ rated power

*VHF product is compliant with applicable FCC narrowbanding mandate below 512 MHz.

ENVIRONMENTAL SPECIFICATIONS

STANDARD	PARAMETER	METHODS & PROCEDURES
MIL-STD-810G*	Low Pressure	500.5, Proc. I, II
	High Temperature	501.5, Proc. I, II
	Low Temperature	502.5, Proc. I, II
	Temperature Shock	503.5, Proc. I
	Solar Radiation	505.5, Proc. II
	Blowing Rain**	506.5, Proc. I
	Humidity	507.5, Proc. II
	Salt Fog	509.5, Proc. I
	Blowing Dust	510.5, Proc. I
	Vibration (Minimum Integrity)	514.6, Proc. I, Category 24
	Shock (Functional/Basic)	516.6, Proc. I
	Shock (Transit Drop)	516.6, Proc. IV
U.S. Forest Service	Vibration Stability	Par. 2.15

*Also meets equivalent superseded MIL-STD-810D, -E, and -F.
** CH-100 and CH-721 control units meet IP-65/MIL-STD-810, XG-100M radio unit meets IP-54

DIGITAL OPERATION

PROTOCOL	P25
Vocoding Method:	AMBE+2™ Enhanced Full Rate & Enhanced Half Rate
Data Rate (kbps):	9.6
Modulation:	Phase1 TX: C4FM, RX: C4FM & WCQPSK Phase 2 TX: HCPM, RX: WCQPSK
Encryption Algorithms:	AES (FIPS-140-2 certified), DES-OFB, DES-CFB
Encryption Keys:	128 keys (64 AES, 64 DES)
Encryption Keying:	Harris Keyloader, P25 Conventional and Trunked OTAR, KVL-3000+ with CH-100

REGULATORY DATA

FREQUENCY RANGE (MHz)	RF OUTPUT (W)	FREQUENCY STABILITY (ppm)	FCC TYPE ACCEPTANCE NUMBER	APPLICABLE FCC RULES	INDUSTRY CANADA CERTIFICATION NUMBER	APPLICABLE INDUSTRY CANADA RULES	NTIA CERTIFICATION NUMBERS
30-50	0.009	0.5	AQZ-XG-100M00	80, 90	122D-XG100M00	RSS-119	NA
136-174	50	0.5	AQZ-XG-100M00	22, 80, 90	122D-XG100M00	RSS-119	J/F 12/9952
156-162	50	0.5	AQZ-XG-100M00	22, 80	122D-XG100M00	RSS-119	J/F 12/9952
380-520	50	0.5	AQZ-XG-100M00	22, 90	122D-XG100M00	RSS-119	J/F 12/9952
763-775, 793-805	30	0.5	AQZ-XG-100M00	90	122D-XG100M00	RSS-119	NA
806-824, 851-869	35	0.5	AQZ-XG-100M00	90	122D-XG100M00	RSS-119	NA

Technical specifications are subject to change without notice. Product sales are subject to applicable U.S. export control laws.

HARRIS®

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harris.com

Unity® XG-100P
Portable
Full-Spectrum
Multiband

ULTIMATE PERFORMANCE IN ONE RADIO

Unity XG-100P: The Truly Interoperable Solution for P25 Multiband Performance

The Unity XG-100P full-spectrum multiband radio's user-centric design delivers unprecedented interoperability, ease of use, and advanced capabilities in a radio that users can depend on for years to come. By supporting both digital APCO P25 secure and analog FM communications across the VHF, UHF, and 700/800 MHz bands in a single radio, responders can communicate with multiple jurisdictions and agencies operating on multiple frequencies and systems. Designed to scan continuously across all bands, voice modes, and encryption types, the XG-100P provides users exceptional capability and interoperability in a rugged radio that meets the requirements of mission-critical communications.

Standard features found on the Unity XG-100P include:

> AMBE+2™ Vocoder – provides noise cancellation capability and enhances audio quality

> Active Noise Cancellation – with dual microphones for users in noisy environments

> Built-in GPS – for position tracking and rapid response for emergencies

> Factory Mutual Intrinsically Safe – for operation in hazardous conditions when paired with an Intrinsically Safe battery and other accessories

> Rugged for Field Use – meets MIL-STD-810G for durability and immersion

Built upon Harris' long history of fielding mission-critical software-defined radios that support evolving customer requirements through software-only upgrades, the Unity XG-100P allows flexibility for future growth.

HARRIS ®

*assured*communications ®

FUTURE READY

The Unity XG-100P is an investment that agencies can rely on as transitions occur to P25 technology. It supports P25 conventional and trunked operation, wideband and narrowband channels, and its software-defined architecture allows field upgrading to operating modes such as P25 Phase 2. With a 3-year standard radio warranty, the Unity XG-100P is a future-proof investment.

SUPERIOR AUDIO EXPERIENCE

The XG-100P features Harris' proprietary noise suppression capability to provide clear and crisp voice quality in high-noise environments. The radio is designed with dual microphones and advanced signal processing technology for built-in noise suppression. The AMBE+2 vocoder optimizes the quality of communications and controls distortions to provide one of the best audio experiences available.

NEXT-GENERATION USER INTERFACE

The user-centric design of the XG-100P offers significant capability and flexibility beyond push-to-talk:

> Intuitive menu-driven graphical user interface with full-color display
> Large 5-way navigation key and soft keys
> User-defined switch
> Large knobs and a configurable top display
> Front-panel programming

ADVANCED FEATURES

The XG-100P delivers the advanced features required by critical communication users.

> P25 Conventional Situational Awareness employs GPS data to aid in personnel accountability. The radio screen displays a unique identifier for each XG-100P user as well as that user's position in the area.
> Multiple Mixed Systems Zones allows users to communicate across multiple types of systems: analog conventional, P25 trunked, and P25 conventional. Zones composed of multiple systems are created and users can assign knob positions to channels and talkgroups on these disparate systems.
> Command Tactical Zone allows users to create custom zones to communicate with radios not part of preset zones, regardless of frequency and with no need for programming through computer interfaces. Custom zones provide up to 48 additional channel assignments.
> Bluetooth® Clone enables communications between multiple versions and types of radio programming. With the press of a few buttons, users clone programming in seconds to effectively communicate with other users.

ACCESSORIES

The XG-100P operates with a full complement of Harris accessories. Several are highlighted below.

The VC4000 Charger may be mounted in a vehicle or used as a desk charger to charge Li-Ion and Li-Polymer batteries in about 4 hours. The unit provides microprocessor-controlled charging for long battery life and maximum battery performance, and protective circuitry to prevent damage to batteries resulting from charging when outside the required temperature or voltage range. The VC4000 can charge batteries with or without the radio attached, and can accommodate a portable with the speaker mic and/or belt clip still attached.

The Wireless Bluetooth Remote Speaker Microphone (RSM) affords XG-100P users the capability to add an RSM to their system wirelessly. This Class 2 device, with a 10-meter wireless range, employs Secure Simple Pairing and encryption and contains a Lithium rechargeable battery with a 12-hour shift life. The compact design includes volume control buttons, a dedicated Emergency button, PTT button, Pairing and Power buttons, a 2.5-mm audio jack for earpiece accessories, and a ruggedized lapel clip for secure attachment to clothing.

The Standard Speaker Microphone includes a two-position volume control setting, emergency button, rubber PTT, and earphone jack in a compact yet highly functional design. A clothing clip that rotates a full 360 degrees provides complete accessibility. With construction that meets MIL standard specifications, this speaker microphone meets the needs of a wide range of users.

GENERAL SPECIFICATIONS

Dimensions (H x W x D):
(Without Knobs and Antenna)
With battery:
6.50 x 2.43 x 1.83 in.
(167.6 x 61.7 x 46.5 mm)

Weight (with Battery):
22.5 oz (638g)

Input Voltage:
7.5 VDC (nominal)

Immersion:
1 meter for 30 minutes in accordance with MIL-STD-810G

Battery Life (at 5% Tx, 5% Rx, and 90% standby):
Li-Polymer: >12 hours
(3600 mAH)

Operating Temperature Range:
-4 to +140°F (-20 to +60°C)

Relative Humidity:
Per MIL-STD-810G

Altitude:
Operational: 15,000 ft
(4,572 m)
In Transit: 40,000 ft
(12,192 m)

Front Display:
176 pixels x 200 pixels, 2.2 in. transflective LCD, 16-bit color with white LED backlight

Top Display:
128 pixels x 32 pixels, 0.91 in. Organic Light-Emitting Diode (OLED)

Keypad:
Backlight, 2 soft keys, 5-way navigation key, 4x3 keypad, home button

Buttons/Switches:
Large PTT button, on/off knob, volume knob, red emergency button, 16-position top-mounted rotary knob, 2-position concentric switch, 3-position toggle switch, 3 programmable side buttons

TX/RX Indicator:
Multi-color LED

Channel Capacity:
12,500 (1,250 per mission plan)

Options and Accessories
Speaker microphones, programming software and cables, surveillance accessories, antennas, cases, straps, belt loops and swivel mounts, and desk chargers.

Intrinsically Safe Options
Factory Mutual Intrinsically Safe for Class I, II, and III, Division 1, Groups D, F, and G, hazardous (classified) locations and suitable for Class I, Division 2, Groups A, B, C, and D hazardous (classified) locations.

N24862

EXCEPTIONAL OPERATION FOR CRITICAL COMMUNICATIONS

TRANSMITTER

TYPICAL PERFORMANCE SPECIFICATIONS	FULL-SPECTRUM MULTIBAND*
Frequency Range (MHz):	136-174 (VHF), 380-520 (UHF), 762-870 MHz (700/800)
Rated RF Power (W):	VHF: 1-6, UHF: 1-5, 700/800: 0.5-3
Rated RF Power Talkaround (W):	VHF: 1-6, UHF: 1-5, 700/800: 0.5-3
Frequency Stability (-30 to +60°C) (ppm):	±0.5
Modulation Limiting (kHz):	2.5, 4, 5 (FM)
Audio Response (dB):	+1/-3
Spurious and Harmonics (dBc):	-70, FCC Part 90
FM Hum and Noise @ 25 kHz (dB):	VHF: -51, UHF: -54, 700/800: -50
@ 12.5 kHz (dB):	VHF: -45, UHF: -47, 700/800: -44
Audio Distortion (%):	<1.25
Project 25 Modulation Fidelity (%):	<1.00
Project 25 Adjacent Channel Power (dBc):	>67
Emission Designators:	16K0F3E, 11K0F3E, 8K4F1E, 8K4F1D, 12K00G1E, 12K00G1D, 14K0F3E

*VHF product is compliant with applicable FCC narrowbanding mandate below 512 MHz.

RECEIVER

TYPICAL PERFORMANCE SPECIFICATIONS	FULL-SPECTRUM MULTIBAND*
Frequency Range (MHz):	136-174 (VHF), 380-520 (UHF), 762-870 MHz (700/800)
Channel Spacing (kHz):	25 (wideband*), 12.5 (narrowband)
Sensitivity (12 dB SINAD) (dBm):	VHF: -121.1, UHF: -123.0, 700/800: -121.4
Project 25 Reference Sensitivity @ 5% BER (dBm):	VHF: -121.0, UHF: -122.9, 700/800: -121.4
Adjacent Channel Rejection @ 25 kHz (dB):	VHF: 77.8, UHF: 73.7, 700/800: 72.7
P25 Adjacent Channel Rejection @ 12.5 kHz (dB):	VHF: 66.2, UHF: 62.2, 700/800: 62.0
Intermodulation (dB):	VHF: 74.3, UHF: 78.8, 700/800: 78.5
Spurious and Image Rejection (dB):	VHF: 70, UHF: 75, 700/800: 70
FM Hum and Noise @ 25 kHz (dB):	VHF: -54.8, UHF: -49.1, 700/800: -48.2
@ 12.5 kHz (dB):	VHF: -53.8, UHF: -43.7, 700/800: -42.8
Rated/Max. Audio Output (mW):	500/1200
Audio Distortion:	1.1% @ rated power

*VHF product is compliant with applicable FCC narrowbanding mandate below 512 MHz.

ENVIRONMENTAL SPECIFICATIONS

STANDARD	PARAMETER	METHODS & PROCEDURES
MIL-STD-810G*	Low Pressure	500.5/1,2
	High Temperature	501.5/1,2
	Low Temperature	502.5/1,2
	Temperature Shock	503.5/1
	Solar Radiation	505.5/1
	Blowing Rain	506.5/1
	Humidity	507.5/2
	Salt Fog	509.5/1
	Blowing Dust & Sand	510.5/1,2
	Immersion	512.5/1
	Vibration (Minimum Integrity)	514.6/1, Category 24
	Vibration (Basic Transportation)	514.6/1, Category 4
	Shock (Functional/Basic)	516.6/1
	Shock (Transit Drop)	516.6/4
	Shock (Bench Handling)	516.6/6

*Also meets equivalent superseded MIL-STD-810D, -E, and -F.

DIGITAL OPERATION

PROTOCOL	P25
Vocoding Method:	AMBE+2™ Enhanced Full Rate & Enhanced Half Rate
Data Rate (kbps):	9.6
Modulation:	Phase1 TX: C4FM, RX: C4FM & WCQPSK Phase 2 TX: HCPM, RX: WCQPSK
Encryption algorithms:	AES (FIPS-140-2 certified), DES-OFB, DES-CFB
Encryption keys:	128 keys (64 AES, 64 DES)
Encryption keying:	Harris Keyloader, P25 Conventional and Trunked OTAR, KVL-3000+

REGULATORY DATA

FREQUENCY RANGE (MHz)	RF OUTPUT (W)	FREQUENCY STABILITY (ppm)	FCC TYPE ACCEPTANCE NUMBER	APPLICABLE FCC RULES	INDUSTRY CANADA CERTIFICATION NUMBER	APPLICABLE INDUSTRY CANADA RULES	NTIA CERTIFICATION NUMBER
136-174	6.0	0.5	AQZ-XG-100P00	22, 80, 90	122D-XG100P00	RSS-119	J/F 12/9952
380-520	5.0	0.5	AQZ-XG-100P00	22,90	122D-XG100P00	RSS-119	J/F 12/9952
763-775, 793-805	2.5	0.5	AQZ-XG-100P00	90	122D-XG100P00	RSS-119	NA
806-824, 851-869	3.0	0.5	AQZ-XG-100P00	90	122D-XG100P00	RSS-119	NA

Bluetooth®

Technical specifications are subject to change without notice. Product sales are subject to applicable U.S. export control laws.

HARRIS®

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XG-25M
Mobile
VHF, 700/800 MHz

WHEN COMMUNICATION AND PERFORMANCE MATTER

XG-25M: The Feature-rich and Economical Solution for Narrowband P25 Performance

The XG-25M meets the challenge. Armed with Bluetooth® functionality and ready for operation in the narrowband frequencies, the XG-25M is the economical solution for those who seek out the best in radio value. The XG-25M accomplishes this without sacrificing the functionality that is expected from a Harris radio in the XG family: exceptional audio in a rugged and compact design.

Standard features found on the XG-25M include:

> Enhanced User Experience – offers a front-mount control unit with an oversized display, substantial internal speaker for improved audio performance, and large easy-to-read buttons

> AMBE+2™ Vocoder – provides noise cancellation capability and enhances audio quality

> Bluetooth Functionality – avoid troubles with corded microphones

> Rugged for Field Use – meets MIL standard for durability

The XG-25M uses advanced technology to deliver critical interoperable communications and unique wireless applications to users.

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FUTURE READY

The XG-25M is an economical investment that agencies can rely on as transitions occur to P25 technology. The mobile supports P25 conventional and trunked operation, wideband and narrowband channels, and its software-defined architecture allows field upgrading to operating modes such as P25 Phase 2.

SUPERIOR AUDIO EXPERIENCE

The XG-25M delivers the exceptional audio that users have grown to expect from Harris. The large internal speaker provides extremely powerful audio, and the AMBE+2 vocoder optimizes the quality of communications. In high-noise emergency situations, the mobile delivers loud and clear audio, even with sirens blaring and fire engines running. Through the combination of an over-sized speaker and the AMBE+2 vocoder, the XG-25M provides one of the best audio experiences available.

BLUETOOTH READY

The XG-25M delivers Bluetooth functionality for a wireless interface to selected accessories. Bluetooth provides freedom of movement with no protruding parts or cumbersome wires or cables, allowing users the flexibility to operate without the use of corded microphones or programming cables if desired.

RUGGED DESIGN

The XG-25M is a member of the family of field-proven, reliable, and rugged mobiles in the Harris portfolio. Durable construction enables the XG-25M to operate in demanding environments. The mobile meets MIL-STD-810G for shock and vibration, dust, salt fog, humidity, rain, solar radiation, low pressure, and temperature extremes and has an Ingress Protection rating of IP54 for dust intrusion and splashing water.

EASY USER INTERFACE

From the oversized display to the large easy-to-read buttons on the front-mount control unit, each aspect of the radio has been developed to provide a better user experience. Simple controls allow users to communicate seamlessly and effectively in a range of surroundings. Since the XG-25M is easy to operate, users may focus attention on the task rather than on radio operation.

GENERAL SPECIFICATIONS

Dimensions (H x W x D):

Radio and Control Unit
(Includes Knobs but not space for Mounting Bracket and Cables):

2.8 x 7.24 x 7.9 in.
(7.1 x 18.4 x 20.0 cm)

Weight (Without Bracket):

5.9 lb (2.6 kg)

DC Supply Voltage Operating Range:

For Full Performance:
13.6 VDC ± 10% (Normal range per TIA-603)
Overall Operating Range:
13.6 VDC ± 20%

DC Supply Current Requirements:

Transmit at 50 Watts:
15 amps maximum
Receive Standby:
1.4 amps maximum
Receive with 15-Watt Ext.
Speaker Output Power:
4.0 amps maximum

Operating Temperature Range:

-22 to +140°F
(-30 to +60°C)

Storage Temperature Range:

-40 to +176°F
(-40 to +80°C)

Relative Humidity:

90% @ 122°F (+50°C)

Altitude:

Operational: 15,000 ft
(4,572 m)
In Transit: 50,000 ft
(15,240 m)

Options and Accessories

Front mount kit, bracket, microphone, antennas, optional external speaker, option cables, and pro-gramming cables.

RoHS compliant

RUGGED AND FEATURE-RICH MOBILE RADIO

TRANSMITTER

TYPICAL PERFORMANCE SPECIFICATIONS	VHF	700/800 MHz
Frequency Range (MHz):	136-174	764-776, 794-805, 806-825, 851-870
Rated RF Power (W):	10-50	30-35
Frequency Stability (-30 to +60°C; +25°C Ref) (ppm):	±2	±1.5
Frequency Separation (MHz):	38 (full bandwidth)	NA
Modulation Deviation (kHz):	5.0 (wideband*) 2.5 (narrowband)	2.5, 4, or 5 FM
FM Hum and Noise (Companion Receiver) (dB):	49 (wideband*) 45 (narrowband)	44 (700 MHz) 47 (800 MHz NPSPAC) 48 (800 MHz non-NPSPAC)
Spurious and Harmonics (dBm/dBc):	-42/-80	-55/-90
Audio Response (dB):	+1/-3	Meets TIA-603-C Section 3.2.6
Audio Distortion (1 kHz tone): @ 3kHz deviation: @ 2.4 kHz deviation: @ 1.5 kHz deviation:	1% (wideband*) NA 1% (narrowband)	1% (800 MH non-NPSPAC) 1% (800 MHz NPSPAC) 1% (700 MHz NPSPAC)
Project 25 Modulation Fidelity (%):	5	1
Project 25 Adjacent Channel Power (dBc):	67	73

*VHF product is compliant with applicable FCC narrowbanding mandate below 512 MHz.

RECEIVER

TYPICAL PERFORMANCE SPECIFICATIONS	VHF	700/800 MHz
Frequency Range (MHz):	136-174	764-776, 851-870
Frequency Separation (MHz):	38 (full bandwidth)	NA
Channel Spacing (kHz):	25 (wideband*) 12.5 (narrowband)	12.5, 25
Frequency Stability (-30 to +60°C: +25°C Ref) (ppm):	±1.5	±1.5
Sensitivity (12 dB SINAD) (μV/dBm):	0.25/-119.0 (wideband*), 0.30/-117.5 (narrowband)	0.21/-120.5 (700 MHz) 0.18/-122.0 (800 MHz NPSPAC) 0.19/-121.5 ((800 MHz non-NPSPAC)
Selectivity @ 12.5 kHz (dB):	60	60
@ 15 kHz (dB):	60	60
@ 25 kHz (dB):	75	75
Intermodulation (dB):	75	80
Spurious and Image Rejection (dB):	>80	>80
Rated Audio Output: Internal Speaker: Optional External Speaker:	8 ohm rated at 3 Watts 4 ohm rated at 15 Watts	500 mW
Audio Distortion:	<3% @ rated power	1.5% @ rated audio output power
Project 25 Reference Sensitivity @ 5% BER (μV/dBm):	0.22/-120.0	0.22/-120
Project 25 Adjacent Channel Rejection (dB):	60	64

*VHF product is compliant with applicable FCC narrowbanding mandate below 512 MHz.

ENVIRONMENTAL SPECIFICATIONS

STANDARD	PARAMETER	METHODS & PROCEDURES
MIL-STD-810G*	Low Pressure	500.5/1,2
	High Temperature	501.5/1,2
	Low Temperature	502.5/1,2
	Temperature Shock	503.5/1
	Solar Radiation	505.5/2
	Blowing Rain	506.5/1
	Humidity	507.5/2
	Salt Fog	509.5/1
	Blowing Dust	510.5/1
	Vibration (Minimum Integrity)	514.6/1, Category 24
	Vibration (Basic Transportation)	514.6/1, Category 4
	Shock (Functional/Basic)	516.6/1
	Shock (Transit Drop)	516.6/4
IEC 60529	Dust-tight, Powerful Water Jets	IP54
U.S. Forest Service	Vibration (10-60 Hz)	USDA LMR Standard, Section 2.15
TIA-603-C	Shock (1 meter drop)	Paragraph 3.3.5.3

*Also meets equivalent superseded MIL-STD-810D, -E, and -F.

DIGITAL OPERATION

PROTOCOL	PROVOICE™	P25
Vocoding Method:	AMBE+2™ Enhanced Full Rate	AMBE+2™ Enhanced Full Rate & Enhanced Half Rate
Signaling Rate (kbps):	9.6	9.6
Modulation:	GFSK	Phase1 TX: C4FM, RX: C4FM & WCQPSK Phase 2 TX: HCPM, RX: WCQPSK
Encryption Algorithms:	AES (FIPS-140-2 certified) & DES	AES (FIPS-140-2 certified) & DES
Encryption Keys:	128 keys (64 AES, 64 DES)	128 keys (64 AES, 64 DES)

REGULATORY DATA

FREQUENCY RANGE (MHz)	RF OUTPUT (W)	FREQUENCY STABILITY (ppm)	FCC TYPE ACCEPTANCE NUMBER	APPLICABLE FCC RULES	INDUSTRY CANADA CERTIFICATION NUMBER	APPLICABLE INDUSTRY CANADA RULES	NTIA CERTIFICATION NUMBER
136-174	50	±2	OWDTR-0075-E	22, 80, 90	3636B-0075	RSS-119, RSS-210	J/F 12/10037
769-869	35	±2	OWDTR-0075-E	90	3636B-0076	RSS-119, RSS-210	NA

Technical specifications are subject to change without notice. Product sales are subject to applicable U.S. export control laws.

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XG-25P
Portable
VHF, UHF, 700/800 MHz

WHEN COMMUNICATION AND PERFORMANCE MATTER

XG-25P: The Feature-rich and Economical Solution for Narrowband P25 Performance

The XG-25P meets the challenge. Armed with Bluetooth® functionality and ready for operation in the narrowband frequencies, the XG-25P is the economical solution for those who seek out the best in radio value. The XG-25P accomplishes this without sacrificing the functionality that is expected from a Harris radio in the XG family: exceptional audio in a rugged and lightweight design.

Standard features found on the XG-25P include:

> AMBE+2™ Vocoder – enhances audio quality
> Lightweight Design – does not weigh down a user with its total weight of 15 ounces (including Lithium Ion battery)
> Rugged for Field Use – meets MIL standard for durability

Optional features include:

> Bluetooth Functionality – avoid troubles with corded microphones
> Factory Mutual Intrinsically Safe – for operation in hazardous conditions when paired with an Intrinsically Safe battery and other accessories

Available in both System and Scan models, the XG-25P offers a full complement of accessories to suit a variety of user needs.

SCAN   **SYSTEM**

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FUTURE READY

The XG-25P is an economical investment that agencies can rely on as transitions occur to P25 technology. The portable supports P25 conventional and trunked operation, wideband and narrowband channels, and its software-defined architecture allows field upgrading to operating modes such as P25 Phase 2.

SUPERIOR AUDIO EXPERIENCE

The XG-25P delivers the exceptional audio that users have grown to expect from Harris. The large speaker provides extremely powerful audio, and the AMBE+2 vocoder optimizes the quality of communications. The vocoder also controls distortion that may occur from shouting into the microphone. Through the combination of an oversized speaker and the AMBE+2 vocoder, the XG-25P provides one of the best audio experiences available.

BLUETOOTH READY

The XG-25P delivers Bluetooth functionality for a wireless interface to selected accessories. Bluetooth provides freedom of movement with no protruding parts or cumbersome wires or cables, allowing users the flexibility to operate without corded microphones or programming cables if desired.

LIGHTWEIGHT AND ERGONOMIC DESIGN

The XG-25P is one of the lightest radios in the Harris portfolio, weighing 15 ounces with the Lithium Ion battery. From the keypad buttons to the battery, each aspect of the radio has been developed to provide a better user experience. The knobs and buttons of the XG-25P have been designed to be strong enough to avoid incidental changes while still being easily managed by users wearing heavy gloves. The XG-25P is simple to operate so users may focus attention on the task rather than on radio operation.

ACCESSORIES

The XG-25P operates with a wide range of Harris accessories. Several of the newest accessories are shown below.

The 3600 mAH Lithium Polymer battery is the highest capacity Harris battery for single-band radios. Offering the ultimate in performance and ease of use, the battery has an average 16-hour shift life, 400 charge cycles, and maintenance-free Lithium battery technology. With its IP67 rating for immersion and dust/dirt particle intrusion, the battery is ideal for public safety, commercial and industrial, and utility applications.

The Wireless Bluetooth Remote Speaker Microphone (RSM) affords XG-25P users the capability to add an RSM to their system wirelessly. This Class 2 device, with a 10-meter wireless range, employs Secure Simple Pairing and encryption and contains a Lithium rechargeable battery with a 12-hour shift life. The compact design includes volume control buttons, a dedicated Emergency button, PTT button, Pairing and Power buttons, a 2.5-mm audio jack for earpiece accessories, and a ruggedized lapel clip for secure attachment to clothing.

The Standard Speaker Microphone includes a two-position volume control setting, emergency button, rubber PTT, and earphone jack in a compact yet highly functional design. A clothing clip that rotates a full 360 degrees provides complete accessibility. With construction that complies with MIL standard specifications, this speaker microphone meets the needs of a wide range of users.

GENERAL SPECIFICATIONS

XG-25P Portables are available in 2 models:

System: With dot matrix LCD and DTMF keypad

Scan: With dot matrix LCD and limited keypad

Dimensions (H x W x D):
(Without Knobs and Antenna)
With battery:
5.89 x 2.44 x 1.85 in.
(149.6 x 62.0 x 47.0 mm)

Weight (with Battery & Antenna):
Li-Ion: 15.0 oz (425g)
Li-Polymer: 16.4 oz (465g)
NiMH: 18.8 oz (533g)

Input Voltage:
7.5 VDC (nominal)

Vibration:
5 G (per U.S. Forest Service)

Shock:
1 meter drop (per TIA-603-C)

Battery Life (at 5% Tx, 5% Rx, and 90% standby):
Li-Ion: 8 hours (2000 mAH)
Li-Polymer: 16 hours (3600 mAH)
NiMH: 10 hours (2400 mAH)

Operating Temperature Range:
Li-Ion: +14 to +140°F
(-10 to +60°C)
Li-Polymer: -4 to +140°F
(-20 to +60°C)
NiMH: -4 to +140°F
(-20 to +60°C)

Relative Humidity:
90% @ 122°F (+50°C)

Altitude:
Operational: 15,000 ft
(4,572 m)
In Transit: 50,000 ft
(15,240 m)

Color (case):
Black

Options and Accessories
Headset, earpiece, speaker microphones, PC programming software and cables, subminiature surveillance accessories, antennas, cases, straps, belt loops and swivel mounts, desk chargers, and wall chargers.

Intrinsically Safe Options*
Factory Mutual Intrinsically Safe for Class I, II, and III, Division 1, Groups C, D, E, F, and G, Temp T3C, TA=+60°C; Nonincendive for Class I, Division 2, Groups A, B, C, and D, Temp T4, TA=+60°C.
*For VHF only

RoHS compliant

RUGGED AND FEATURE-RICH PORTABLE RADIO

TRANSMITTER

TYPICAL PERFORMANCE SPECIFICATIONS	VHF	UHF	700/800
Frequency Range (MHz):	136-174	378-470	764-776, 794-805, 806-825, 851-870
Rated RF Power (W):	1.0-5.0	5	3
Frequency Stability (-30 to +60°C; +25°C Ref) (ppm):	±1.5	±1.5	±1.5
Frequency Separation (MHz):	38 (full bandwidth)	92 (full bandwidth)	NA
Modulation Deviation (kHz):	5.0 (wideband*) / 2.5 (narrowband)	5.0 (wideband*) / 2.5 (narrowband)	2.5, 4, or 5 FM
FM Hum and Noise (Companion Receiver) (dB):	49 (wideband*) / 45 (narrowband)	49 (wideband*) / 44 (narrowband)	44 (700 MHz) / 47 (800 MHz NPSPAC) / 46 (800 MHz non-NPSPAC)
Spurious and Harmonics (dBm/dBc):	-42/-80	-36/73	-55/90
Audio Response (dB):	+1/-3	+1/-3	+1/-3
Audio Distortion (1 kHz tone): @ 3 kHz deviation: @ 2.4 kHz deviation: @1.5 kHz deviation:	1% (wideband*) / NA / 1% (narrowband)	1% (wideband*) / NA / 1% (narrowband)	1% (800 MHz non-NPSPAC) / 1% (800 MHz NPSPAC) / 1% (700 MHz)
Project 25 Modulation Fidelity (%):	1	1.5	1.5
Project 25 Adjacent Channel Power (dBc):	71.5	67	72

*VHF and UHF product is compliant with applicable FCC narrowbanding mandate below 512 MHz.

RECEIVER

TYPICAL PERFORMANCE SPECIFICATIONS	VHF	UHF	700/800
Frequency Range (MHz):	136-174	378-470	764-776, 851-870
Frequency Separation (MHz):	38 (full bandwidth)	92 (full bandwidth)	NA
Channel Spacing (kHz):	25 (wideband*) / 12.5 (narrowband)	25 (wideband*) / 12.5 (narrowband)	12.5, 25, PLL Step
Frequency Stability (-30 to +60°C: +25°C Ref) (ppm):	±1.5	±1.5	±1.5
Sensitivity (12 dB SINAD) (μV/dBm):	0.25/-119.0 (wideband*) / 0.30/-117.5 (narrowband)	0.25/-119.0 (wideband*) / 0.30/-117.5 (narrowband)	0.21/-120.5 (700 MHz) / 0.21/-120.5 (800 MHz NPSPAC) / 0.21/-120.5 (800 MHz non-NPSPAC)
Project 25 Adjacent Channel Rejection @12.5 kHz (dB):	62	62	62
Offset Channel Selectivity@ NPSPAC (dB):	NA	NA	25
Selectivity @ 12.5 kHz (dB): @ 15 kHz (dB): @ 25 kHz (dB):	67 / 72 / 78	60 / NA / 72	66 (700 MHz) / NA / 77 (800 MHz non-NSPPAC)
Intermodulation (dB):	78	75	78
Spurious and Image Rejection (dB):	82	73	82
FM Hum and Noise (dB):	54 (wideband*) / 51 (narrowband)	54 (wideband*) / 48 (narrowband)	49 (700 MHz) / 53 (800 MHz NPSPAC) / 54 (800 MHz non-NPSPAC)
Rated Audio Output (mW):	500	500	500
Audio Distortion:	1% @ rated power	1% @ rated power	1% @ rated audio output power
Project 25 Reference Sensitivity @ 5% BER (μV/dBm):	0.22/-120.0	0.22/-120.0	0.22/-120.0

*VHF and UHF product is compliant with applicable FCC narrowbanding mandate below 512 MHz.

ENVIRONMENTAL SPECIFICATIONS

STANDARD	PARAMETER	METHODS & PROCEDURES
MIL-STD-810G*	Low Pressure	500.5/1,2
	High Temperature	501.5/1,2
	Low Temperature	502.5/1,2
	Temperature Shock	503.5/1
	Contamination by Fluids	504.1/2
	Solar Radiation	505.5/2
	Blowing Rain	506.6/1
	Humidity	507.4
	Salt Fog	509.5
	Blowing Dust	510.5/1
	Blowing Sand	510.5/2
	Vibration (Minimum Integrity)	514.6/1, Category 24
	Vibration (Basic Transportation)	514.6/1, Category 4
	Shock (Functional/Basic)	516.6/1
	Shock (Transit Drop)	516.6/4
IEC 60529	Dust-tight, Powerful Water Jets	IP66
U.S. Forest Service	Vibration (10-60 Hz)	USDA LMR Standard, Section 2.15
TIA-603-C	Shock (1 meter drop)	Paragraph 3.3.5.3

*Also meets equivalent superseded MIL-STD-810D, -E, and -F.

DIGITAL OPERATION

PROTOCOL	PROVOICE™	P25
Vocoding Method:	AMBE+2™ Enhanced Full Rate	AMBE+2 Enhanced Full Rate & Enhanced Half Rate
Signaling Rate (kbps):	9.6	9.6
Modulation:	GFSK	Phase 1 TX: C4FM, RX: C4FM & WCQPSK / Phase 2 TX: HCPM, RX: WCQPSK
Encryption Algorithms:	AES (FIPS-140-2 certified) & DES	AES (FIPS-140-2 certified) & DES
Encryption Keys:	128 keys (64 AES, 64 DES)	128 keys (64 AES, 64 DES)

REGULATORY DATA

FREQUENCY RANGE (MHz)	RF OUTPUT (W)	FREQUENCY STABILITY (ppm)	FCC TYPE ACCEPTANCE NUMBER	APPLICABLE FCC RULES	INDUSTRY CANADA CERTIFICATION NUMBER	APPLICABLE INDUSTRY CANADA RULES	NTIA CERTIFICATION NUMBER
136-174	5.0	±1.5	OWDTR-0072-E	22, 80, 90	3636B-0072	RSS-119, RSS-210	J/F 12/10038
378-470	5.0	±1.5	OWDTR-0109-E	22, 80, 90	3636B-0109	RSS-119, RSS-210	J/F 12/10038
769-869	3.0	±1.5	OWDTR-0073-E	90	3636B-0073	RSS-119, RSS-210	NA

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XG-75 Portable
VHF, UHF-L, 700/800 MHz

RELIABLE PERFORMANCE UNDER HARSH CONDITIONS

XG-75: The Most Robust Solution for Mission-Critical Communications

The XG-75 meets the requirements for a rugged radio that performs under the most adverse conditions. Delivering high reliability, multi-mode operation, clear voice quality, secure communications, and assured interoperability, the portable provides the tools first responders need to communicate with each other and their command centers in day-to-day service and emergencies to defend and protect lives.

Standard features found on the XG-75 include:

> Extremely Rugged for Field Use – meets MIL-STD-810G for durability and certified for more stringent tests of 1.5-meter drop to concrete

> Active Noise Cancellation – with dual microphones for users in noisy environments

> AMBE+2™ Vocoder – provides noise cancellation capability and enhances audio quality

> Single-Key DES Encryption – affords secure communications

> Instant Recall – allows user to replay last transmission received

> Lightweight Design – does not weigh down a user with its total weight of 14.4 ounces (including Lithium Ion battery)

Optional features available for the XG-75 include:

> Immersion (IP68) – additional certification for immersion of 2 meters for 4 hours

> Factory Mutual Intrinsically Safe – permits operation in hazardous conditions when paired with an Intrinsically Safe battery and other accessories

Available in both System and Scan models in black and gray, tactical green, midnight black, or high-visibility yellow, the XG-75 offers a full complement of accessories that operate under the special conditions experienced by first responders.

SCAN   SYSTEM

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FUTURE READY

The XG-75 is an investment that agencies can rely on as transitions occur to P25 technology. The portable supports wideband and narrowband channels and its software-defined architecture allows field upgrading to operating modes such as P25 Phase 2.

SUPERIOR AUDIO EXPERIENCE

The XG-75 delivers the exceptional audio that users have grown to expect from Harris. The enlarged speaker chamber provides extremely powerful audio, up to 3.8 Watts. Dual microphones, Harris' active noise-cancelling algorithm, and the AMBE+2 vocoder optimize the quality of communications. The vocoder also controls distortion that may occur from shouting into the microphone. Through high-quality voice coding and robust audio components, the XG-75 provides the loud and clear audio that critical communication users require.

EQUIPPED FOR EXTREME CONDITIONS

The XG-75 meets the highest immersion and drop specifications of any Harris radio. The portable was certified to MIL-STD-810G transit drop shock testing of 26 drops from a 48-inch height to wood and then the same radio unit was certified to MIL-STD-810G immersion testing in 1 meter for 4 hours. In addition, the portable is certified for a 1.5-meter drop to concrete, immersion of 2 meters for 4 hours, and IP68 dust-tight and continuous immersion. The XG-75 is Intrinsically Safe and approved by Factory Mutual for use under hazardous conditions. The XG-75 meets the stringent requirements for operation in extreme environments.

LIGHTWEIGHT AND ERGONOMIC DESIGN

The XG-75 is one of the lightest radios in the Harris portfolio, weighing 14.4 ounces with the Lithium Ion battery. From the keypad buttons to the battery, each aspect of the radio has been developed to provide a better user experience. The knobs and buttons of the XG-75 are designed to be strong enough to protect against impact and are shaped to avoid incidental changes while still being easily managed by users wearing heavy gloves. The XG-75 is simple to operate so users may focus attention on the situation rather than on radio operation.

ACCESSORIES

The XG-75 is available with a wide range of Harris accessories. Several are shown below.

The VC4000 Charger may be mounted in a vehicle or used as a desk charger to charge NiMH and Li-Ion batteries in about 1.5 hours. The unit provides microprocessor-controlled charging for long battery life and maximum battery performance and protective circuitry to prevent damage to batteries resulting from charging when outside the required temperature or voltage range. The VC4000 can charge batteries with or without the radio attached, and can accommodate a portable with the speaker mic still attached.

The heavy-duty over-the-head headset provides clear two-way radio communications in high noise environments. It has a certified noise reduction rating of 24 dB and includes a flexible noise-canceling boom microphone that fully rotates for left- or right-side positioning, cloth-covered ear seals, and in-line PTT. Cables are durable and flexible for demanding environments.

The 3600 mAH Lithium Polymer battery is the highest capacity Harris battery for single-band radios. Offering the ultimate in performance and ease of use, the battery has an average 16-hour shift life, 400 charge cycles, and maintenance-free Lithium battery technology. With its IP67 rating for immersion and dust/dirt particle intrusion, the battery is ideal for public safety, commercial and industrial, and utility applications.

GENERAL SPECIFICATIONS

XG-75 Portables are available in 2 models:

System: With dot matrix LCD and DTMF keypad

Scan: With dot matrix LCD and limited keypad

Dimensions (H x W x D):
(Without Knobs and Antenna)
With battery:
5.89 x 2.44 x 1.94 in.
(149.6 x 62.0 x 48.5 mm)

Approximate Weight (with Battery):
Li-Ion: 14.41 oz (408g)
Li-Polymer: 15.76 oz (447g)
NiMH: 18.28 oz (518g)

Input Voltage:
7.5 VDC (nominal)

Vibration:
9.2 G (per U.S. Forest Service)

Drop Shock:
1.5 meter drop to concrete
(exceeds TIA-603-C)

Immersion*:
1 meter for 4 hours with 49°F (27°C)
differential (MIL-STD-810G)
*XG-75 immersion model only

Battery Life (at 5% Tx, 5% Rx, and 90% standby):
Li-Ion: 8 hours (2000 mAH)
Li-Polymer: 16 hours (3600 mAH)
NiMH: 10 hours (2400 mAH)

Operating Temperature Range:
Li-Ion: +14 to +140°F
(-10 to +60°C)
Li-Polymer: -4 to +140°F
(-20 to +60°C)
NiMH: -4 to +140°F
(-20 to +60°C)

Relative Humidity:
90% @ 122°F (+50°C)

Altitude:
Operational: 15,000 ft
(4,572 m)
In Transit: 50,000 ft
(15,240 m)

Color (case):
Black & Gray, Tactical Green, Midnight Black, and High-Visibility Yellow

Options and Accessories
Headset, earpiece, speaker microphones, PC programming software and cables, subminiature surveillance accessories, antennas, cases, straps, belt loops and swivel mounts, desk chargers, and wall chargers.

Intrinsically Safe Options
Factory Mutual Intrinsically Safe for Class I, II, and III, Division 1, Groups C, D, E, F, and G, Temp T3C, TA=+60°C; Nonincendive for Class I, Division 2, Groups A, B, C, and D, Temp T4, TA=+60°C.

RoHS compliant

N24862   For UHF-L frequencies

MEETS STRINGENT REQUIREMENTS FOR CRITICAL COMMUNICATIONS

TRANSMITTER

TYPICAL PERFORMANCE SPECIFICATIONS	VHF	UHF-L	700/800
Frequency Range (MHz):	136-174	378-470	764-776, 794-805, 806-825, 851-870
Rated RF Power (W):	6	5	3 (Trnk & talkaround)
Frequency Stability (-30 to +60°C; +25°C Ref) (ppm):	±1.5	±1.5	±1.5
Frequency Separation (MHz):	Full Bandwidth	Full Bandwidth	NA
Modulation Deviation (kHz):	5.0 (wideband*), 2.5 (narrowband)	5.0 (wideband*), 2.5 (narrowband)	2.5, 4, or 5 FM
FM Hum and Noise (Companion Receiver) (dB):	-52 (wideband*) -50 (narrowband)	-50 (wideband*) -45 (narrowband)	44 (700 MHz) 47 (800 MHz NPSPAC) 48 (800 MHz non-NSPAC)
Spurious and Harmonics (dBm/dBc):	-36/-75	-36/-75	-55/90
Audio Response (dB):	+1/-3	+1/-3	Meets TIA-603-C Section 3.2.6
Audio Distortion (1 kHz tone):			
@ 3 kHz deviation:	<1% (wideband*)	<1% (wideband*)	1% (800 MHz non-NPSPAC)
@ 2.4 kHz deviation:	NA	NA	1% (800 MHz NPSPAC)
@ 1.5 kHz deviation:	<1% (narrowband)	<1% (narrowband)	1% (700 MHz)
Project 25 Modulation Fidelity (%):	<5	<5	1
Project 25 Adjacent Channel Power (dBc):	>67	>67	73

*VHF and UHF product is compliant with applicable FCC narrowbanding mandate below 512 MHz.

RECEIVER

TYPICAL PERFORMANCE SPECIFICATIONS	VHF	UHF-L	700/800
Frequency Range (MHz):	136-174*	378-470	764-776, 851-870
Frequency Separation (MHz):	Full Bandwidth	Full Bandwidth	NA
Channel Spacing (kHz):	25/30 (wideband**), 12.5/15 (narrowband)	25 (wideband**), 12.5 (narrowband)	12.5, 25, PLL Step
Frequency Stability (-30 to +60°C: +25°C Ref) (ppm):	±1.5	±1.5	±1.5
Sensitivity (12 dB SINAD) (µV/dBm):	0.20/-121	0.25/-119.0	0.25/-119.0
Adjacent Channel Selectivity @ 25 kHz (dB):	79 (wideband**)	>73	75 (800 MHz non-NPSPAC)
@ 12.5 kHz (dB):	66 (narrowband)	>60	67 (700 MHz)
Intermodulation (dB):	77	75	75
Spurious and Image Rejection (dB):	80	80	>80
FM Hum and Noise (dB):	>50 (wideband**) >45 (narrowband)	>50 (wideband**) >45 (narrowband)	>40 (700 MHz) >43 (851-854 MHz NPSPAC) >45 (854-870 MHz wideband**) >60 squelched
Audio Output (mW):	500 rated (3800 max)	500 rated (3800 max)	500 rated
Audio Distortion @ Rated Power (%):	1.5	<3	1.5
Project 25 Reference Sensitivity @ 5% BER (µV/dBm):	0.22/-121	0.25/-119	0.22/-120.0
Project 25 Adjacent Channel Rejection (dB):	>60	>60	64

*The following self-quieting frequencies cannot be programmed as receive frequencies: 144.000, 153.600, 163.200, and 172.800 MHz
**VHF and UHF product is compliant with applicable FCC narrowbanding mandate below 512 MHz.

ENVIRONMENTAL SPECIFICATIONS

STANDARD	PARAMETER	METHODS & PROCEDURES
MIL-STD-810G*	Low Pressure	500.5/1,2
	High Temperature	501.5/1,2
	Low Temperature	502.5/1,2
	Temperature Shock	503.5/1
	Solar Radiation	505.5/2
	Blowing Rain	506.5/1
	Humidity	507.5/2
	Salt Fog	509.5/1
	Blowing Dust	510.5/1
	Immersion**	512.5/1
	Vibration (Minimum Integrity)	514.6/1, Category 24
	Vibration (Basic Transportation)	514.6/1, Category 4
	Shock (Functional/Basic)	516.6/1
	Shock (Transit Drop)	516.6/4
IEC 60529	Dust-tight, Continuous Immersion	IP68
U.S. Forest Service	Vibration (10-60 Hz)	USDA LMR Standard, Section 2.15
TIA-603-C***	Shock (1 meter drop)	Paragraph 3.3.5.3

*Also meets equivalent superseded MIL-STD-810D, -E, and -F.
**XG-75 immersion model only. Available option that must be ordered. Additional certification for water intrusion with water depth of 2 meters for 4 hours.
***Environmental test certification of 1.5 meter drop shock to concrete using parameters of TIA-603-C 1.0 meter drop shock with additional height.

DIGITAL OPERATION

PROTOCOL	OPENSKY® (700/800 MHz)	PROVOICE™	P25
Vocoding Method:	AMBE+2™ Half Rate & Enhanced Half Rate	AMBE+2 Enhanced Full Rate	AMBE+2 Enhanced Full Rate & Enhanced Half Rate
Signaling Rate (kbps):	19.2 & 9.6	9.6	9.6
Modulation:	4-Level GFSK & M4FM	GFSK	Phase1 TX: C4FM, RX: C4FM & WCQPSK Phase 2 TX: HCPM, RX: WCQPSK
Encryption Algorithms:	AES	AES (FIPS-140-2 certified) & DES	AES (FIPS-140-2 certified) & DES
Encryption Keys:	--	128 keys (64 AES, 64 DES)	128 keys (64 AES, 64 DES)

REGULATORY DATA

FREQUENCY RANGE (MHz)	RF OUTPUT (W)	FREQUENCY STABILITY (ppm)	FCC TYPE ACCEPTANCE NUMBER	APPLICABLE FCC RULES	INDUSTRY CANADA CERTIFICATION NUMBER	APPLICABLE INDUSTRY CANADA RULES	NTIA CERTIFICATION NUMBER
136-174	6	±1.5	OWDTR-0059-E	22, 80, 90	3636B-0059	RSS-119	J/F 12/9974
378-470	5	±1.5	OWDTR-0070-E	90	3636B-0070	RSS-119	J/F 12/9974
764-776, 794-806, 806-824, 851-869, 854-869	3	0.2	OWDTR-0074-E	90	3636B-0074	RSS-119	NA

Technical specifications are subject to change without notice. Product sales are subject to applicable U.S. export control laws.

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XG-75M Mobile
VHF, UHF, 700/800 MHz

RELIABLE PERFORMANCE UNDER HARSH CONDITIONS

XG-75M: A Robust Solution for Mission-Critical Communications

Mobile with Front Mount CH-721 Scan Control Unit

Mobile with Remote Mount CH-721 System Control Unit

The XG-75M* meets the requirements for a rugged radio that performs under the most adverse conditions. Delivering high reliability, multi-mode operation, clear voice quality, secure communications, and assured interoperability, the mobile provides the tools first responders need to communicate with each other and their command centers in day-to-day service and emergencies to defend and protect lives. The mobile operates on VHF, UHF, and 700/800 MHz frequencies and supports Harris' Enhanced Digital Access Communications System (EDACS®) and ProVoice™ digital trunking, OpenSky® digital trunking, P25 digital conventional, P25 digital trunking, and analog conventional operating modes.

Standard features found on the XG-75M include:

> AMBE+2™ Vocoder – provides noise cancellation capability and enhanced audio quality

> Rugged Design for Field Use – meets MIL-STD-810F for durability

> Single-Key DES Encryption – affords secure communications

Optional features available for the XG-75M include:

> GPS Capability – for position tracking and rapid response for emergencies

> OTAP – for remote downloading of radio personalities over the air to reduce the amount of time and labor required to reprogram radios

> Multiple Control Units – select from system, scan, and hand held units to best meet conditions and requirements

The XG-75M is a state-of-the art radio designed to operate under the special conditions experienced by first responders.

*Formerly denoted as M7300.

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FUTURE READY

The XG-75M is an investment that agencies can rely on as transitions occur to P25 technology. The mobile supports wideband and narrowband channels and its software-defined architecture allows field upgrading to operating modes such as P25 Phase 2.

SUPERIOR AUDIO EXPERIENCE

The XG-75M delivers the exceptional audio that users have grown to expect from Harris. The AMBE+2 vocoder optimizes the quality of communications and also controls distortion that may occur from shouting into the microphone. Through high-quality voice coding and robust audio components, the XG-75M provides the loud and clear audio that critical communication users require.

ADVANCED COMMUNICATION FEATURES

The XG-75M provides advanced features for first responders.

> Over-the-Air Programming (OTAP) allows radio features and user profiles to be reprogrammed quickly over the air. This feature allows communications protocols to be changed easily and added at any time.

> GPS provides quick and accurate unit location information to dispatchers via the P25 or OpenSky radio network.

> OpenSky trunking is a secure integrated digital voice and data communications system that leverages the power of Internet Protocol (IP) and packet technology for reliability and scalability to bring open data applications to users.

CONTROL UNITS FOR SPECIALIZED CONDITIONS

The XG-75M offers multiple control units to meet special requirements. All are available in front or remote mount designs.

> The CH-721 control unit has a 3-line 8-character alphanumeric display. The control unit is available in Scan (limited keypad) or System (full keypad) models and supports P25, 800 MHz EDACS and ProVoice, and OpenSky trunking operation. The Scan model has large menu selection buttons. The System model has a 12-button keypad to allow advanced operations without a DTMF microphone. The front panel also has an ambient light sensor for automatic display dimming.

> The HHC-731 Hand Held Controller provides the advanced features of the CH-721 System control unit, including siren and light bar control, in a compact package. The ruggedized design meets a full range of environmental specifications and supports P25, 800 MHz EDACS and ProVoice, and OpenSky trunking operation. The 3-line 8-character alphanumeric display is backlit for use in low-light areas. The small size of the HHC-731 makes it ideal for covert operations and use in space-constrained environments.

The XG-75M is available with a wide range of Harris accessories. Examples are shown on the left.

ACCESSORIES

The motorcycle kit provides reliable communications for the officer on the front line, through day-to-day operations and in emergencies. The kit includes a weather-resistant locking radio case with integral antenna ground plane. A radio case mounting plate kit secures the case and radio to the back of the motorcycle. The kit interfaces with the CH-721 System and Scan control units and is capable of supporting an external headset, ignition A+ sensing, external encode/decode devices as well as siren/public address systems.

The noise-cancelling microphone provides clear communication, even in noisy environments such as near fire trucks and heavy machinery. The mobile microphone is designed to withstand heat and humidity and is immune to oil, grease, most fumes and solvents, salt spray, sun, rust, and corrosion. With its robust components, the noise-cancelling microphone provides the high-quality audio needed by first responders.

GENERAL SPECIFICATIONS

Dimensions (H x W x D):
VHF Radio Only (110W):
2.4 x 6.9 x 11.0 in.
(61 x 175 x 279 mm)
VHF Radio Only (50W):
2.0 x 6.9 x 9.2 in.
(50 x 175 x 233 mm)
UHF & 700/800 Radio Only (30W):
2.0 x 6.9 x 9.2 in.
(50 x 175 x 233 mm)
Radio and Control Unit (Includes Knobs):
2.4 x 6.9 x 12.3 in.
(60 x 175 x 311 mm)
Control Unit (Remote):
2.4 x 7.0 x 4.0 in.
(60 x 175 x 100 mm)

Weight:
VHF Remote Mount (110W):
7.55 lb (3.42 kg)
VHF, UHF, 700/800 Front Mount:
5.9 lb (2.68 kg)
VHF, UHF, 700/800 Remote Mount:
Transceiver only: 5.25 lb (2.38 kg)
CH-721 CU: 1.25 lb (0.57 kg)

System Voltage:
10.8 to 16.6* VDC Negative Ground
*Not to exceed 14.3V above +50°C for motorcycle applications.

DC Supply Current:
Transmit (110W):
25 amps maximum, 23 amps typical
Transmit:
15 amps maximum, 11 amps typical
Receive (Includes CH-721 CU):
4.0 amps maximum (with 15-Watt speaker output power)
Standby:
1.1 amps typical

Ambient Temperature Range:
-22 to +140°F
(-30 to +60°C)

Relative Humidity:
90% @ 122°F (+50°C)

Altitude:
15,000 ft (4,572 m)

Duty Cycle:
TIA/EIA-603

Programming:
Field PC Programmable

Mounting:
Front or Remote Mount available

Construction:
Control Unit: High Impact Plastic
Transceiver: Cast Metal

Speaker:
Weather-Resistant External, 15W

Operation:
12 VDC Negative Ground

Options and Accessories
Remote mount kit, system and scan control units, hand held controller, mobile mic, DTMF mic, noise cancelling mic, desk mic, desktop control station, and motorcycle kit (30 and 50W only).

RoHS compliant

MEETS STRINGENT REQUIREMENTS FOR CRITICAL COMMUNICATIONS

TRANSMITTER

TYPICAL PERFORMANCE SPECIFICATIONS*	VHF	UHF	700/800
Frequency Range (MHz):	136-174	378-430, 440-512	764-776, 794-806, 806-825, 851-869
Rated Power Output (W):	8-50, 50-110	10-50	30 (35 EDACS/P25 800)
RF Output Impedance (ohm):	50	50	50
Frequency Stability (ppm):	±2.0	±1.5	±1.5
Modulation Deviation (kHz):	±5	±5	±5 (±4 NPSPAC)
FM Hum and Noise (dB):	52 (wideband) 46 (narrowband)	52 (wideband) 46 (narrowband)	47 (wideband) 44 (narrowband)
Audio Response (dB):	+1/-3, 300-2500 Hz	+1/-3, 300-2500 Hz	+1/-3, 300-3000 Hz
Audio Distortion (typical):	<2.5% @ 1 kHz <5.0% @ 2.5 kHz	2% @ 1 kHz	2.55% @ 1 kHz
Spurious and Harmonics Emissions (dBm):	<-20	<-20	<-20
Adjacent Channel Power (dBc):			
C4FM (6 kHz bw):	>67	>67	>67
Wideband/Narrowband:	>70/>60	>70/>60	>70/>60

*VHF and UHF product is compliant with applicable FCC narrowbanding mandate below 512 MHz.

RECEIVER

TYPICAL PERFORMANCE SPECIFICATIONS*	VHF	UHF	700/800
Frequency Range (MHz):	136-174	378-430, 440-512	764-776, 851-870
RF Input Impedance (ohm):	50	50	50
Channel Spacing (kHz):	12.5/25	12.5/25	12.5, 25
Frequency Stability (ppm):	±2.0	±1.5	±1.5
Sensitivity (12 dB SINAD) (µV/dBm): 5%BER:	0.25/-119.0 >0.35/-116	0.25/-119.0 >0.35/-116	0.25/-119 >0.35/-116
Adjacent Channel Selectivity (dB):			
@ 12.5 kHz:	>60	>60	>60
@ 25 kHz:	>80	>80	>80
Intermodulation (dB):	>80	-80 @ 25 kHz	-77 @ 25 kHz
Spurious Rejection (dB):	>90	-90 (except 2nd image)	-90 (except 2nd image)
Audio Response (dB):	+1/-3, 300-2500 Hz	+1/-3, 300-2500 Hz	+1/-3, 300-2500 Hz
Audio Output (W):	15W @ <3% distortion	15W @ <3% distortion	15W @ <3% distortion
Adjacent Channel Interference Power Ratio (dB): C4FM:	>60	>60	>60
FM Hum and Noise Wideband/Narrowband (dB):	>50/>46	>50/>46	>47/>41

*VHF and UHF product is compliant with applicable FCC narrowbanding mandate below 512 MHz.

ENVIRONMENTAL SPECIFICATIONS

STANDARD	PARAMETER	METHODS & PROCEDURES
MIL-STD-810F*	Low Pressure	500.4/1,2
	High Temperature	501.4/1,2
	Low Temperature	502.4/1,2
	Temperature Shock	503.4/1
	Solar Radiation	505.4/2
	Blowing Rain	506.4/1
	Humidity	507.4/2
	Salt Fog	509.4/1
	Blowing Dust	510.4/1
	Vibration (Minimum Integrity)	514.5/1, Category 24
	Shock (Functional/Basic)	516.5/1
	Shock (Transit Drop)	516.5/4
TIA/EIA-603	Vibration Stability	Par. 2.3.4 & 4.3.4
	Shock Stability	Par. 2.3.5 & 3.3.5
U.S. Forest Service	Vibration (10-60 Hz)	Par. 7.15

*Also meets equivalent superseded MIL-STD-810C, -D, and -E.

DIGITAL OPERATION

PROTOCOL	OPENSKY®	PROVOICE™	P25	TIA/EIA-603
Vocoding Method:	AMBE+2™ Half Rate & Enhanced Half Rate	AMBE+2 Enhanced Full Rate	AMBE+2 Enhanced Full Rate & Enhanced Half Rate	Not Applicable
Signaling Rate (kbps):	19.2 & 9.6	9.6	9.6	Analog
Modulation:	4-Level GFSK & M4FM	GFSK	Phase1 TX: C4FM, RX: C4FM & WCQPSK Phase 2 TX: HCPM, RX: WCQPSK	FM
Data Communication Mode:	Half Duplex	Half Duplex	Half Duplex	Half Duplex

ENCRYPTION

Encryption Technique:	Non-Linear Product/Block Transformation
Algorithm Types:	Data Encryption Standard (DES) OFB
	Advanced Encryption Standard (AES) (P25 Trunking, P25 Conventional, & ProVoice Trunking)

REGULATORY DATA

FREQUENCY RANGE (MHz)	RF OUTPUT (W)	FREQUENCY STABILITY (ppm)	FCC TYPE ACCEPTANCE NUMBER	APPLICABLE FCC RULES	INDUSTRY CANADA CERTIFICATION NUMBER	APPLICABLE INDUSTRY CANADA RULES	NTIA CERTIFICATION NUMBER
136-174	50	2.0	OWDTR-0055-E	22, 80*, 90	3636B-0055	RSS-119	J/F 12/9968
136-174	110	2.0	OWDTR-0056-E	22, 90	3636B-0056	RSS-119	NA
406-470	50	1.5	OWDTR-0061-E	90	3636B-0061	RSS-119	J/F 12/9968
764–806	30	1.5	OWDTR-0060-E	90	3636B-0051	RSS-119	NA
806-870	35	1.5	OWDTR-0060-E	90	3636B-0051	RSS-119	NA

*FCC Part 80 approval is for 156-162 MHz only.

Technical specifications are subject to change without notice. Product sales are subject to applicable U.S. export control laws.

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IMPLEMENTATION

PROJECT MANAGEMENT PLAN

Upon contract award, Ci will provide a formal project management organization and project-level administrative overview and corresponding activities necessary for a successful project implementation. The Project Manager will develop and implement a plan to efficiently and effectively execute the requirements of the contract and to describe the methods that will be used for managing and controlling the project. The Project Management Plan developed for the project will be the basis for this update. An initial, projected system implementation and integration timeline is provided below.

Philosophy and Approach

Ci Project Management philosophy is defined in one term: Customer Satisfaction. It is upon earned trust and valued relationships that successful system implementations are built. Ci values its service to the public safety community and will provide the project management excellence to deliver quality products and services while fostering confidence with the City. Ci ensures that The Project Manager will have the resources and authority to ensure efficient, effective, and timely project execution and will be the single focal point for all required project tasks.

The Project Manager will produce and deliver the project schedules and reports and their status to provide the City of Coral Gables with additional insight into the status of program activities. The Project Manager will also identify project risks and develop risk management approaches. These controls will include schedules, written reports, design review meetings, and independent appraisal of work in progress through use of the various members assigned to the program staff. The Project Manager will also provide meeting agendas and meeting minutes for formal customer interface meetings. Ci Project Managers, as standard practice, employ Project Management Institute (PMI) standards and Project Management Processes and Procedures described in the "Project Management Body of Knowledge (PMBOK)" Guide.

Managing an Integrated Team

At Ci, we practice the principle of shared success to foster the strength of a single team working toward shared interests. Sharing knowledge and providing mutual support provides the framework to transcend organizational boundaries and obstructions. This environment of cooperation and shared interests encourages the free-flow of ideas essential to delivering the optimal solutions our customers deserve.

There are three important factors that an Integrated Team requires:

♦ **Peer relationships at design, management and execution levels.** These relationships facilitate peer-review, consultation, and drive accountability at a personal level. Personal excellence is demonstrated through professional conduct and respecting others as valued partners.

♦ **Shared stakeholder goals.** True project success never loses sight of the true end goal: Customer Satisfaction. Ci brings to the City of Coral Gables the experiences and skills to manage a strong integrated team driven to achieve the most important deliverables: provide the City of Coral Gables the very best in all areas of products and services, the very best project plan and execution, and ultimately the very best public safety radio system that will provide years of dependable service to the City and its citizens.

♦ **Executive sponsorship.** the City of Coral Gables teams will include an Executive Sponsor to focus team resources within the organization and for project work in the field. Ci's Executive Sponsor for the City of Coral Gables project is Mark Feurer, President.

Project Management Tasks

Project Schedule

Ci will conduct regular project schedule reviews with the City of Coral Gables to report on progress, identify issues and resolutions, and make any scope modifications as warranted by circumstances. Any modifications will be approved and accepted by the City and Ci.

Project Reporting

The City of Coral Gables representatives and the Ci Project Manager will jointly schedule and attend regular project review meetings. These meeting will include:

- ♦ Review project status
- ♦ Review project schedule
- ♦ Review any written correspondence exchanged since the last meeting
- ♦ Review any open action item(s)
- ♦ Obtain clarifications of any issue(s) or documentation
- ♦ Capture requests for any new information
- ♦ Discuss next steps and actionable items

The Ci Project Manager will prepare the meeting agenda, record the meeting minutes and forward them to the City of Coral Gables for review and approval. Ci will also conduct project presentations and briefings as required.

Ci will participate in other City requested meetings, as-needed conference calls, community meetings and assist in community outreach and regulatory processes.

Ci will prepare and submit monthly project progress/status reports to the City that include updates to the following items:

- ♦ Project Schedule, milestone and work plan
- ♦ Project Management Web Portal correspondence transmitted and open action items
- ♦ Documentation Schedule
- ♦ Status of open change requests and change orders

> **Successful Planning = Successful Projects**
>
> ✓ Ci designed, planned and installed the largest 700/800 MHz trunked system in all of Florida
>
> ✓ There is a reason Harris trusts Ci to be their largest Integrator in North America – Planning for On-Schedule and On-Budget projects

♦ Current and anticipated project problem areas or risks

Ci will provide for the storage and retrieval of design documents, design drawings, correspondence, and other supporting documents. The web portal will be accessible using a standard web browser (not rely on any specialized client software) and have a secure connection.

Quality Control/Quality Assurance

Ci will develop and maintain Total Project Quality by executing the City of Coral Gables radio project with a high level of Process/Quality Control (QC), coupled with strong Quality Assurance (QA) rooted in best practices from hundreds of successful system implementation projects. Cost control is a direct result and benefit of Ci's QA and QC activities. Experience demonstrates that maintaining Total Project Quality is the most direct way of developing and maintaining Cost Controls; and with this combined benefit, the City of Coral Gables will be very pleased with the results.

Ci will develop and maintain quality at both the Business Level and Program Level as described in the following sections.

Business Level

Ci's Business Level Quality Management plan is the framework within which the City of Coral Gables Project is executed.

Ci's approach to Quality Management emphasizes the use of Quality Systems. Responsibility and authority for Quality Control is placed within the appropriate functional organization, supplier, and/or subcontractor. Responsibility and authority for higher level Quality activities are placed under the purview of Ci's Quality Assurance organization, which reports directly to Ci's Executive Management.

The Executive Management Team monitors the performance of the QMS by reviewing the results of Quality Assurance activities—such as internal auditing—but also through review of Quality Objectives that represent the Quality Control metrics being applied at all levels within Ci. Quality Objectives measure Ci's ability to satisfy a customer's requirements and expectations. They target continual improvement and strive for:

- Excellence in overall customer satisfaction.
- Excellence in delivered product and service quality.
- Excellence in purchased product/service quality.
- Excellence in product and service delivery.
- Excellence in the minimization of the Cost of Poor Quality.

Ci's Executive Management is committed to quality, as is that of our supplier partners.

Program Level (Program Team and Program Management Office in Tampa, FL)

At the Program level, Ci will develop and maintain Quality Control processes and practices. Ci's team has been successfully implementing these best practices for valued customers throughout Florida and surrounding states for nearly 4 decades.

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Strong Quality Control management provides effective cost control, and all of this effort ultimately makes a very satisfied customer – the City of Coral Gables.

- A commitment to the entire the City of Coral Gables Radio Project Team – Program Management, Quality Assurance, Procurement, Technical/Engineering, Contracts, Site Management, and Service.
- A PMBOK™-certified Program Manager coordinating a Project Management Plan that meets PMI PMBOK requirements.
- Program Management that proactively executes and enforces QC activities, while constructively engaging independent QA activities.
- Strong QC processes like Design Review/Submittal, Document/Records Control, Configuration Management, Change Management, and Issues/Risk Management.
- Close Partnerships between Ci and suppliers, each with well documented Quality Standards.

Ci will also provide independent semi-annual audits by our corporate Quality Assurance organization. Ci's integrity is built upon trust, honesty, and accountability. This is our commitment to the City of Coral Gables.

In summary, Ci understands the level of oversight that the City of Coral Gables intends to maintain for this project. Programs like the City of Coral Gables radio implementation project are highly visible, critically important, and under intense pressure to maintain the highest safety standards. They are also under rigorous scrutiny from governmental agencies and departments, consumer protection groups, and the news media. Ci and equipment supplier Harris are experienced with, and welcome, strong customer involvement through a robust Quality Assurance program aimed at stepping methodically and transparently through each program phase.

Ci stands behind every system we analyze, design, develop, and deploy. the City of Coral Gables's radio system will be a resounding success through unparalleled attention to detail and dedication. Ci's partner and equipment supplier Harris also has a strong reputation for integrity, as demonstrated by being the only DMR and LMR manufacturer selected as one of the "World's Most Ethical Companies" by Ethisphere in 2009.

Change Order Management

Ci has built a reputation on deploying projects similar in size and scope to the City of Coral Gables on time and within budget. The City can be sure that we will meet all its expectations with our proposed solution, including meeting budget requirements and minimizing change orders throughout the duration of this project.

Ci will implement a thorough change control process that is based on our experience but tailored to this unique project. This process will include managing project scope, while insuring project timelines and budgetary needs are met. Ci will meet internally and with the City of Coral Gables officials regarding projected risks and mitigation strategies identified both pre-sale and during the project implementation process.

When change is required, Ci will meticulously analyze potential impacts to the project and will determine what adjustments are necessary regarding scope, schedule, or costs in order to reduce or eliminate any resulting negative impacts of these adjustments.

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Neither Ci nor the City of Coral Gables will be obligated to perform requested changes unless both parties execute a written change order. Both parties will meet to resolve any changes needed in the cost or timeline required to perform the contract, and results will be document as part of the Change Order Management process.

Project Risks and Mitigation

Ci will provide a rigorous Risk Management Plan to anticipate, identify, evaluate, mitigate and retire program risks that can adversely affect a program team's ability to meet its schedule, cost, and technical requirements. Ci's Risk Management Plan will be based upon standardized processes tailored for application to the City of Coral Gables project. The Risk Management Plan will include the following components:

- Risk Management Strategy
- Risk Management Organization composed of:
    - Risk Manager
    - Risk Owner
    - Risk Review Board
- Risk Management Processes to include:
    - Planning for Risk
    - Identifying Risk
    - Analyzing Risk Items
    - Handling Risk Resolutions
    - Monitoring Solutions

Risk management will be a continuous, proactive process used throughout all phases of the City of Coral Gables radio project with the appropriate stakeholders involved in each phase.

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STATEMENT OF WORK (SOW)

Ci will provide System Integration services to the City of Coral Gables (referred-to throughout this document as "the City"), for providing the infrastructure equipment for the project as identified in this Contract. Ci will perform the work and tasks required to design, install, optimize, test, and integrate a Harris 800 MHz P25 IP Trunked Simulcast Radio Network. Ci will provide the contractually required level of documentation and training to support operation of this radio network, to the City. Ci and the City will each provide a dedicated Program Manager to act as the single point of contact for all administrative, technical, and scheduling issues. The Ci Program Manager has the overall responsibility for providing the Ci deliverables required for the implementation of the radio network and management of the project schedule. The City Program Director has the overall responsibility for ensuring that all City responsibilities and tasks are completed per the Contract schedule. Ci is responsible for providing the appropriate level of project staffing to sup the implementation of the radio network.

When the City issues a Notice-To-Proceed (NTP) for the project, the Ci Project Manager will schedule the Pre-Implementation Scheduling Meeting with the City of Coral Gables at a mutually agreed upon time and facility. The Ci Project Manager will introduce all the project participants and discuss the proposed Work Plan and project schedule to include:

- Roles of the project participants
- Overall project scope and objectives
- Resource and scheduling requirements
- Current site status
- Proposed frequency plan and coordination

This implementation plan describes the required actions and project deliverables for successful implementation of the City of Coral Gables' three-site 800 MHz IP simulcast system.

SCOPE

As described in our System design section, Ci is proposing Harris Corporation's Trunked P25 IP simulcast system integrated with a Microwave Networks, Inc. (MNI) microwave backbone.

The Ci proposed Harris 800 MHz P25 IP system solution includes the following:
- An Integrated Voice and Data Land Mobile Radio (LMR) communication network
- Interoperability subsystems
- Microwave Transport Network
- System alarm and control network
- Dispatch Center upgrades
- Migration of Users from existing Networks to the P25 IP Radio Network

PROJECT SCHEDULE

Ci will conduct regular project schedule reviews with the City of Coral Gables to report on progress, identify issues and resolutions, and make any scope modifications as warranted by circumstances. Any modifications will be approved and accepted by the City of Coral Gables and Ci. Ci and the City will develop a detailed Project Schedule upon contract award.

SITE SURVEYS

Immediately following the Pre-Implementation Scheduling Meeting, the Ci Project Manager and representatives from the City of Coral Gables will arrange for additional site surveys to collect further data about each individual site to help prepare for implementation. Ci and its subcontractors will conduct the detailed electrical, grounding, and HVAC surveys as well as determine that sufficient space exists to support the proposed design at each of the proposed sites, buildings, and vehicles (if mobile installations are included).

The site survey results will be used to prepare the documents for each site detailing the floor plan, rack drawings, and power and HVAC requirements. Ci will conduct an internal review of all the survey analyses, the resultant drawings, coverage maps and Acceptance Test Plans (ATP) as applicable.

CUSTOMER DESIGN REVIEW

After Site Surveys, Ci will incorporate the information into a Customer Design Review (CDR) and begin preparing the final design documents. All sites and frequencies will be finalized at least thirty (30) calendar days before the Final Design Review (FDR) meeting can be conducted. This is necessary to properly prepare for the FDR. The City of Coral Gables and Ci may mutually agree to conduct a preliminary design reviewing in order to make risk-based decisions necessary for the overall benefit of the project.

At the FDR, Ci will present in detail the design and how the various systems will be integrated and operate. The engineers will present their design decisions used to support the project design, and the Program Manager and key subcontractors will present their site development plans, as required, at each site. At the end of the FDR, the City of Coral Gables will review the material, and within 30 days, provide written approval to Ci. For the purpose of maintaining the schedule, open issues can be captured on an issues list where the City of Coral Gables and Ci can mutually agree to proceed with the system implementation. Open issues can be addressed as new information and design solutions are completed.

Suggested Preliminary Agenda:

Technical

- Technical Description of System Configuration.
- System Operation Description.
- Logging Recorder Functionality (customer supplied).
- Backhaul Infrastructure Descriptions.

- Alarm System Description.
- Network Manager Description.
- Equipment Configurations.
- Testing/Acceptance Overview.
- Radio System Factory ATP.
- Interfaces.
  - Interface between the new radio system and legacy transport systems.
  - Interface between new and legacy radio systems.
  - Interface between new equipment and Power - -UPS – Generators.
  - Interface between Localities and Agencies.
- Schedule Review.
- Floor Plans
- RF Design
- Electrical Layout

Training, Cutover, and Migration

- System migration and implementation at existing facilities.
- A preliminary cutover plan will be provided to the City of Coral Gables prior to the Contract Design Review.
- Microwave migration at existing tower sites.
- The training plan will be reviewed and finalized.

Table 1 - Responsibility Matrix

Description	Ci	The City of Coral Gables
Create Project Schedule	X	
Provided detailed design and engineering of proposed system	X	
Conduct final design review	X	Participate
Conduct local frequency licensing and coordination	X	
Provide all required equipment per the final design	X	
Receive, document, and inventory all shipped equipment, retain shipping documents	X	
Assist the City of Coral Gables with their inventory and affix asset tags, if required	X	X
Stage, program, and configure equipment, and conduct pre-ship conformance test at Ci Vero Beach	X	Participate
Provide access, adequate equipment space, appropriate electrical power and other support equipment necessary for proper installation		X

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Install Ci provided equipment in accordance with the final design requirements	X	
Provide access to a public/static IP address allowing access into network		X
Configure, test, and validate the installed product/system	X	
Perform tower structural analysis' and loading inspections (if required)		X
Provide towers suitable in available space and strength to accommodate the installation of Ci-proposed antennas and lines		X
Conduct formal Acceptance Test	X	Participate
The City of Coral Gables Acceptance – sign off		X
Provide and conduct system user training as specified	X	Participate
Develop cutover plan and perform system cutover, provide all materials and personnel required	X	Participate
Provide P25 IP Logging Recorder		X
Interface P25 LMR System to customer-provided IP logging recorder system	X	
Program IP Logging Recorder with P25 database parameters	Participate	X

SYSTEM STAGING

Ci will factory stage the City of Coral Gables Radio System prior to delivery to the field. Staging of the equipment allows for the pre-assembly of the subsystems and system to verify connectivity, functionality and performance capabilities, and to identify and eliminate equipment and system defects prior to shipment of the system to the field. The staging of the Radio Network subsystems will be at Ci's Corporate Headquarters located in Vero Beach, Florida. Staging will not require a customer visit, but the City is always welcome to visit during the process and will be provided with all data from these FATPs.

Ci will set up the system hardware and load all equipment software at the staging facility. Physical set up and location of hardware will comply with the radio network equipment layout plans. All cables will be cut and labeled with to/from information to clarify interconnection for field installation. Cables will be cut to fit the room layout plan specifications as supplied by Ci's Field Engineer. All provided equipment cables will be connectorized and tested.

Staging Optimization

The staging technicians will power up, load software, set levels, and optimize the equipment during factory staging. The staging technicians will load application software. System parameters will be set according to inputs from the field team. System software and system features will be tested and validated. All "system" levels will be set per specification by the

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staging technician to verify proper end-to-end connectivity. These "system" levels will be recorded and documented to provide baseline information to the field integration team; all levels will be checked and reset, where applicable, prior to final optimization in the field. Once the system or subsystem has been assembled, optimized, and integrated as a complete working unit, the system will be tested using the procedures identified in an internal staging acceptance test procedure similar to the one that will be utilized in the field.

SYSTEM INSTALLATION

Ci employs its own highly-trained personnel to install, configure, integrate, and verify the system and all of its components at each of the City's sites, to ensure a high-quality and on-time system implementation. Ci will maintain ultimate responsibility for installation of all site equipment provided in our Equipment List, as detailed in the Description of System and Services section of this proposal, and according to manufacturer specifications. Ci takes pride in each customer installation, and will also ensure all equipment is installed neatly and professionally, and in accordance with all applicable local, state, and federal standards and regulations. Any required changes to the installation will be logged, with a final system installation description provided for each site, to ensure that the City of Coral Gables understands exactly how the system is constructed.

Dispatch Installations

Ci will install the Maestro IP Dispatch Console equipment at the City's Dispatch Centers at the Police Department and backup center at the city's Radio Shop. The dispatch facilities included in the Radio Network will utilize city-provided console furniture and new, Ci-provided console dispatching equipment. Ci will install all new console equipment into the City provided console furniture at the dispatch facilities as identified in the Contract. All cabling will be properly dressed and provide a minimum of 5' of slack to allow some movement of the equipment. All cabling will include appropriate labeling at each end. All cabling will be labeled at both ends and all demarcation information properly documented. All racks for the Network Switching Center equipment will be securely fastened to the floor. All equipment will be properly grounded per Harris' Standards and Guidelines.

Logging Recorder Installation and Configuration

The City of Coral Gables will provide their own IP Logging Recorder system, and thus is not part of Ci's scope. Ci will interface to this city-provided recorder.

Console Furniture

The City of Coral Gables will provide all console furniture, and thus is not part of Ci's scope.

Network Switching Center Installation

Ci will provide, install and configure the Network Switching Center or NSC, which is composed of Network Switching Servers (NSS). Ci will locate the Network Switching Server at the Police Department. The required IP network backhaul between the NSS and the City of Coral Gables' radio sites shall be provided by the City's existing fiber WAN system.

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Site Equipment Installation

The following sections summarize work performed at each site, and describe the installation, configuration and programming of the major radio system fixed-site components. Once the Design Review has been approved, Ci will proceed to place orders for the materials required to configure the City of Coral Gables system.

For installation of the fixed equipment at the transmitter sites and dispatch facilities, Ci will furnish all power, audio, control, and radio transmission cables connecting the Harris supplied equipment to the power panels or receptacles and the audio/control line connection point. Ci will provide the necessary building penetrations for these cables. All Ci provided equipment will be properly grounded to the site's grounding system using Harris' Standards and Guidelines. All cabinets, racks, enclosures, telephone circuit surge protectors, and transmission line surge protectors provided by Ci will be connected to the single point ground. Ground connections will be connected using approved split bolt or clamp connections. All painted surfaces where ground connections will be made will be scraped and dissimilar metal connections treated with an antioxidant compound.

Table 2 – High-Level Summary of On-Site Work for the City of Coral Gables Project

Location	Work Required
Police Department Dispatch Center	- Install equipment racks and bolt to the floor, install grounding and power - Install and configure VIDA Core elements (RVM, Primary NSC, NSS) - Install and configure VIDA Interoperability Gateway - Install and configure BeOn - Install and configure network equipment for interconnection - Install and configure all provided routers and switches - Interface the VIDA network to existing Coral Gables fiber LAN/WAN network - Install Symphony consoles, connect to IP NSC LAN, configure, test, optimize - Program, install, test, and optimize backup radios and control stations - Interface control stations to VIDA Network First Interoperability Gateway circuits
RF Sites	- Install microwave antenna and transmission line including coax at radio end - Install rectifiers per quote - Provide power and grounding

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Location	Work Required
	- Install DSX panel (if provided) or DS1 cables as a point of demarcation for DS1s if required. - Install and configure microwave Network Management System (NMS), connect to IP network - Perform path alignments as required - Test and optimize microwave hops - Install equipment racks and bolt to the floor, install grounding and DC Power Plants - Install RF Site equipment for the Harris Trunked P25 IP system - Install coaxial cabling from the repeaters to their respective combiners and multicoupler ports - Provide power and grounding - Install and configure the P25 IP antenna and combining systems - Install and configure all provided routers and switches - Install and configure the P25 Network Sentry - Install new multicoupler/combiner and RF systems - Install new antennas and transmission line, perform sweeps and document - Interface the radio network to Ci-provided microwave transport network - Prepare as-built documentation - Test and Optimize, record test data
	Prepare as-built documentation

RF Site Equipment

As described in the system description, the Ci radio network design for the City of Coral Gables is a three-site 800 MHz P25 IP simulcast solution. The transmit sites include both a transmitter and receiver for each of the channels.

The sites are equipped with a network alarm monitoring system that constantly monitors the site equipment and automatically notifies the System Manager of local equipment failures. Ci will develop a plan, with input from the City, on alarms point definitions and how these alarms get reported back to the network monitoring equipment.

The Ci Project Manager will work with the City of Coral Gables to provide site access to our field service installation team after the equipment has been delivered from our partners at Harris. Using the Harris installation methods and proven experience, our installation team will install per grounding and electrical standards discussed earlier. Ci System Engineers will provide as-built drawing packages of the equipment racks with cabling and alarm information.

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Placement and Mounting

Ci will install all Ci provided communications equipment per the agreed to floor plans that are developed during the design reviews. Thirty-six inch clearances will be provided in the front or side aisles (as applicable) to satisfy all safety codes. Equipment will be installed such that no equipment will be required to be moved for maintenance after installation.

Antenna Systems

Ci will provide and install Receive Multicouplers, Tower Top Amplifers, Transmit Combiners, and Filtering products at the P25 radio sites. Ci relies upon our preferred RF products vendors and longtime partners, including dbSpectra, to provide the RF components for our systems. These key system components provide the best in quality, reliability, performance, workmanship, and cost effectiveness from a company that stands behind their products.

Ci will follow the manufacturer's specifications, guidelines, and/or structural engineer's recommendations in the assembly and installation of all antenna systems unless Ci deems the Harris standards and guidelines to be more stringent, in which case the Harris standards and guidelines will be followed. Ci will utilize appropriate cable manufacturer's connectors with exceptions as specified by MNI in the Microwave network, and assemble the cables per the manufacturer's specifications and guidelines. Transmission lines will be properly secured/fastened to the cable tray or ladder attached to the tower using the manufacturer's recommended devices while following either Harris standards and guidelines or the manufacturer's recommendations. Transmission lines will be installed using a hoisting grip, which will be used at the top and at 200 foot intervals to provide strain relief.

INDOOR BI-DIRECTIONAL AMPLIFIER (BDA) SYSTEM

Ci's proposed system was designed to maximize RF coverage and minimize or eliminate BDA use, and, as such, no BDAs were required or employed as part of our design.

FREQUENCY PLANNING

Ci will provide initial system design work, which will include professional services to develop a frequency plan for the City of Coral Gables radio networks within this Contract. This includes the Land Mobile Radio Network and the Microwave Transport network. Upon completion of the initial assignment of frequency pairings by channel and by tower site, each available tower site will be monitored with appropriate equipment; including spectrum analyzers, to establish an in-field baseline measurement of fixed and mobile transmit or receive frequencies for each of the following items:

- Peak and Average Environmental noise floor within each potential range of frequencies
- Co-channel interference
- Adjacent channel interference
- Transmitter noise (which could cause receiver desense)
- Intermodulation interference

MICROWAVE TRANSPORT SYSTEM

Ci will provide, install, and optimize the microwave subsystem and DC Battery Plant equipment. Ci will adhere to the same installation and optimization practices as stated for the other subsystems. Antenna systems, with radomes, elliptical waveguide and wave guide attachment; mounting and pressurization parts and hardware will be furnished for all microwave links. Antenna systems will meet all design parameters.

Microwave Path Studies and Surveys

Ci and its preferred microwave supplier (MNI) have performed comprehensive studies to predict the path performance for the Microwave Telecommunication subsystem. Ci will conduct physical site and path surveys to verify the performance capability of each recommended microwave path. The results of these path surveys will be reviewed by Ci to determine if the proposed paths will meet the specification requirements and if any alternative path solutions are required.
The results will then be provided to the City for review. Any resulting changes to the overall system design, schedule, and associated costs for the Microwave Transport Network, and/or impact to microwave antenna and tower heights will be addressed, and both Ci and the City of Coral Gables will work toward an equitable resolution to address any required changes.

As part of the optimization for the microwave network, Ci will:

- Sweep transmission lines and record results for all new antenna systems.
- Archive the sweeps and submit to the City as part of the documentation package.
- Perform antenna and path alignments at all tower sites.
- Coordinate system test and alignment with the Customer. Such testing will only include acceptability of Ci provided equipment.
- Measure and record TX/RX local oscillator frequency.
- Measure and record transmitter power at the monitor port.
- Measure and record fade margin.
- Perform (12) twelve hour Bit-Error-Rate Test (BERT) at DS1 level on the primary equipment and record results. Perform (4) four hour BERT at DS1 level on standby equipment and record the results.
- Simulate a failure of the primary equipment and verify switching to standby equipment.
- Install and test orderwire and alarm units (if equipped).
- Verify the operation of all local alarm and control points using the network monitoring system.
- Verify alarm system database is functional.
- Check orderwire operation on each hop (if equipped).
- Optimize and test system to Ci Acceptance Test Procedure (ATP).
- Record test data for inclusion in the "as built" Documentation.

FCC Form Preparation

Ci will provide services for the preparing and submittal of the required FCC Licensing Forms, as well as regional coordination as required. In addition, we will provide the exhibits of the functional system diagram which are required by

FCC rules. The City will be responsible to complete other sections of the form which relate to shared use of facilities, environmental impact, and other non-engineering aspects of the application.

Microwave Project Engineering

Given the results of the path survey, the site survey, and the frequency coordination, Ci will perform the project engineering to develop a detailed equipment list which specifies, on a site-by-site basis, all of the individual items required to implement the new microwave radio system.

In addition to generating the detailed equipment list, the project engineering function also includes the preparation of all of the project specific documentation including rack elevation drawings and wire run lists. The Project Engineer will ensure proper interfacing of the new system to those portions of the existing system that will remain in-use by the new system.

Manufacturing

As the manufacturer of the microwave radio equipment, MNI is clearly differentiated from other companies that provide "services-only" for microwave projects. The MNI Project Manager will monitor all of the radio equipment through the manufacturing process from the material planning phase to the final test. By having real-time access to the status of the manufacturing process, the Project Manager can ensure the successful delivery of the equipment on-site with the start of the installation. Also, whenever situations occur on the project which require a modification to the manufacturing process the Project Manager can initiate the necessary changes quickly and establish the appropriate feedback channels to confirm that the changes are implemented.

Installation

Ci offers a full range of installation services. These services are broken down into four basic categories: Antennas, Waveguide and Feedline, Radios, and Other Related Equipment.

Antenna Installation

Ci will perform all antenna installation work using one of our certified installation service providers who work under the direction of the Ci Project Manager. By acting as prime contractor for both the antenna installation and the other installation activities for the site, the Ci Project Managers will coordinate all activities related to the antenna installation including the delivery of the equipment to the site and the assistance of the tower crew in the path alignment process.

Waveguide and Coaxial Feedline Installation

As part of a turnkey installation, Ci will install the necessary lengths of coaxial feedline to connect the radio to the antenna. Typically, these installations will be on towers. Ci uses certified installation subcontractors for all waveguide and feedline installations. We mandate that our subcontractors adhere to established industry standards such as EIA Standard RS-222, Motorola R56, and Harris' Grounding and Lightning Protection Guidelines, as well as manufacturers' recommendations when installing waveguide and feedline on towers.

Upon the completion of the installation of an antenna system, Ci conducts a sweep test on each section of feedline. The purpose of the sweep test is to verify that the installed system conforms to VSWR specifications across the operating band.

For pressurized waveguide systems, if provided, Ci will also install and test the pressurization equipment. The pressurization equipment will be installed at a location designated in the site plan. Every effort is made to avoid installing the pressurization equipment in or very near the equipment rack. This will minimize any adverse effects that might be caused by vibration. Upon completion of the installation, Ci performs a pressure integrity test of the system.

Radio Installation

At the heart of the installation of any microwave communication system is the radio itself. As manufacturer of the radio, MNI, along with Ci, are uniquely qualified to install and test the radio system. All of our installations are directed and monitored by the Ci Project Manager.

The general scope of the installation includes uncrating, inspection, inventory, setting and securing in place, connection of DC power, connection to transmission system, and path alignment. When channel banks or multiplexing equipment are involved, the installation of these items is also included in the scope of the radio installation. While these general activities provide an overview of the scope of installation, the detailed installation plan will vary from site to site. These variations and any associated cost or schedule impact will be identified as part of the site survey.

Installation of Other Related Equipment

In addition to antennas, coaxial feedline, and radios, Ci can install any other type of equipment related to the new microwave system. These items may include DC power systems, battery banks, standby generators, alarm systems, or whatever else may be required to complete the installation of the new microwave radio system.

POWER SYSTEMS

Electrical design and installation work required for the project will be in accordance with local electrical codes, the relevant sections of the local Building Codes, and/or other applicable codes.

At each site, Ci will determine if the initial incoming power service feeder is sufficiently sized for the full capacity of the facility and new equipment. If needed, Ci will work with the City of Coral Gables and local utilities to increase the incoming power to meet the new electrical power requirements.

GROUNDING SYSTEMS

Following Notice to Proceed (NTP) and the Pre-Implementation Scheduling Meeting and as part of Ci's electrical and grounding design, Ci will conduct detailed electrical and grounding analyses. Ci will prepare and submit to the City of Coral Gables the results of the analyses and our design recommendations for the City's consideration for approval.

For all grounding standards, Ci follows guidelines that have been prepared to improve personal safety and prevent equipment damage. In particular, the Harris guidelines – "Site Grounding and Lightning Protection" AE/LZT 123 4618/1 –

which has been refined over several decades of Land Mobile Radio system implementations, supports the single point ground systems approach and exceeds both NEC and local building codes. The City of Coral Gables can go to Site Grounding and Lightning Protection" AE/LZT 123 4618/1: http://www.repeater-builder.com/ge/lbi-library/t4618r3a.pdf for further information.

As part of a detailed grounding analysis, Ci will verify the condition of the grounding system at each existing facility in accordance with the Harris procedure noted above. Ci will prepare and submit to the City of Coral Gables the results of the analyses along with Ci design recommendations to improve the condition of grounding at these sites. Also, Ci will make required modifications as required and approved by the City and processed as a Change Order.

Ground Bus

Ci will install ground busses in situations where it is necessary to minimize the number of ground conductors connected to the ground window.

Equipment Grounding Connections

Ci will ground all equipment it installs with an equipment grounding conductor that bonds all components to a single point ground bus located near the equipment installation. The installation of multiple cabinets, racks, or enclosures, and any transmission line or circuit protection devices associated with these multiple items that are installed in an area not solely dedicated to the installation of communications equipment will be connected by the designated size and type of grounding conductors. This connection will be to a single point ground window located near the equipment installation within the same equipment shelter, building, room, or area, and connected to a suitable building ground connection or exterior ground system which is bonded to the electrical service ground.

Ground Conductor Length

Ci will keep all grounding conductors as short as possible to reduce the radio frequency impedance to ground. Ci will use the shortest practical ground route with the least number of bends, provided the chosen route does not interfere with the equipment or create a safety hazard.

External Grounding Systems

Ci will be interfacing to existing ground systems. Ci will be happy to assist the City with any required grounding system improvements, if required, through the change order process.

SUBSCRIBER INSTALLATION

Subscriber Radio Equipment

Ci will program all end user portable radio equipment in accordance with the programming templates developed jointly with the City of Coral Gables during the Fleet mapping portions of the Implementation Planning process. Programming and distribution of the end user equipment will be coordinated with training to ensure that the users are fully-trained for productive use of the new system from Day One.

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Programming

All radios will be tested to verify basic operation and functionality, all software applications and configurations will be programmed and tested, and radio IDs and serial numbers recorded in the Asset Management database. Power, frequency and deviation will be verified for the radios. Radios will be programmed with their specific programming template, ID, and serial number recorded in the Asset Management database.

Portable Radio Distribution

Ci will coordinate the distribution of portable radios with the City Project Manager. Ci will document all inventory adjustments in the asset management database as these units are distributed and verify the information with the City Project Manager.

Mobile Radio Installations

The Ci and City Project Managers will coordinate the installation of all mobile radios into the identified vehicles. If necessary, Ci will work with the City Project Manager to develop and approve prototypes of each type of mobile installation for each unique vehicle configuration. These prototype installations will be designed to avoid interference with any functional devices, or adversely affect the safe operation of the vehicles. Ci will not install a radio which knowingly interferes with the safe operation of a vehicle. Ci will additionally test and provide a prototype installation configuration with all known devices in use prior to any final installation in order to, the greatest extent possible, prevent interference. Ci will work with the City to identify locations and mounting hardware that will keep the unit out of the airbag deployment zone as indicated by the published specifications from the manufacturer. The City will work with Ci to finalize the mounting locations based on usability of the equipment. However, instances may arise where the airbag deployment zone is impacted due to the arrangement of preexisting equipment or limitations to the vehicle itself. In those instances, Ci will work with the City to help determine alternate accommodations (which may include not installing the equipment). For vehicles that require unique installations, or where prototyping is not practical, Ci will work with the City Project Manager to develop the agreed upon installation configuration. Examples of these types of vehicles include situations where the City may only operate a small quantity of a specific type of vehicle, or where unique configurations are required such as the Mobile Command Centers and marine vehicles. For these installations, Ci will utilize the standard mounting hardware. With the exception of some types of armored vehicles, for example, it is not anticipated any specialized metalwork or fabrication requirements are required to accommodate unique installations.

Fleet Mapping

In preparing for Cutover, Ci will assist the City of Coral Gables in defining the talkgroup structure and the planning of radio personalities. Ci will work with the City of Coral Gables' representatives to participate in the Radio System Administration and Fleet Mapping Workshop (facilitated by Ci) to define overall system configuration. The City of Coral Gables' representatives should represent the major users of the system and be capable to make key decisions that directly impact all users. The workshop will cover the advantages of different structures, structuring experience gained from other customers, and future expansion considerations. System configuration options (i.e., emergency calls and interoperability) are also explored. After the Ci and City Team have finalized the talk group plans and signed off on the talk

group/personality plan, radio programming and the installation/distribution of terminal units can begin. The distribution of portables and installation of mobiles will be coordinated with the scheduled user and training plans.

INTEGRATION AND TESTING

Once the system installation process is complete, Ci will start the testing and integration portion of the project. This will start with system and site optimization and integration and end with system functional and coverage testing. This robust testing strategy ensures the system will be able to handle the City's operational demands from day one.

System Field Optimization

Once the backbone installation is complete, the Ci System Engineer will work with the on-site technicians to optimize the radio system. First, all levels and parameters will be set and verified at the sites and Control Site. Internet Protocol (IP) addresses and Cross-connect information will be verified against the plan. Finally, all levels and parameters will be documented as part of the site as-built drawing package.

Acceptance Testing

Ci will perform comprehensive acceptance testing after system installation, configuration, and optimization are complete. Testing will be executed according to an Acceptance Test Plan (ATP). The Plan is comprised of a Functional Acceptance Test Procedure (FATP) and a Coverage Acceptance Test Procedure (CATP).

Functional Acceptance Testing

The FATP is intended to confirm the operation of each equipment item in the system. The procedure tests and documents the performance of equipment at the lowest levels, e.g. the parametric testing of a site transmitter. It then builds on these lower level tests by testing and documenting higher level functions, e.g. placing a trunked group call on the radio system. Upon completion of the FATP, the City of Coral Gables will have observed each of the requirements of the RFP being demonstrated and documented. An FATP will be negotiated between the City of Coral Gables and Ci at the System Design Review.

Coverage Testing

Upon completion of the FATP, the CATP may commence. The purpose of the CATP is to demonstrate and document that the installed system meets the City's coverage requirements. Successful completion of the CATP is Ci's commitment to the coverage requirements and constitutes Ci's "coverage guarantee." The CATP will be negotiated between the City of Coral Gables and Ci at the System Design Review.

MIGRATION MANAGEMENT

Ci will be responsible for developing, along with the City, a detailed migration plan for existing land mobile radio and microwave radio networks and users onto the new radio system that will ensure a transfer of communications from

existing networks onto the new radio system and the continued usability of legacy systems as agreed during migration planning sessions and collocated systems operating concurrently with the Harris P25 IP network. The City will have final approval of this plan but will not be responsible for the technical efficacy of the plan as approved. Ci will be responsible for the implementation of the approved plan and the management of the migration process; however, variations to the baseline plan may result which may require additional planning or risk management.

System Cutover and Final Acceptance

When the City of Coral Gables issues an NTP for System Cutover, Ci will begin new user equipment installations. These efforts require careful planning to ensure all tasks and activities are scheduled and coordinated. Ci will work collaboratively with the City of Coral Gables to ensure a smooth and successful cutover. This mutual support will guide cutover activities such as user training, installation schedules, portable radio distribution, and user availability. These activities will be discussed in detail at the System Design Review.

The City of Coral Gables will receive the benefit of Ci's vast experience supporting customer system cutovers. Ci's team of professional system integrators has been performing such operations successfully for over 35 years. The value of this field experience is demonstrated by public safety professionals who appreciate the same values and attention to detail as their own.

Cutover Plan

The System Cutover Plan will detail a smooth transition between the City's use of their existing systems to use of the new 800 MHz Harris P25 IP System as designed. All of this is accomplished while maintaining a smooth continuity and transition to the new radio system. The plan allows for a period of parallel operations of the existing equipment and the new system. Ci is responsible for implementing all software and hardware and providing all necessary equipment and technical personnel required to support system phase-over.

The Cutover Plan provides an outline of the cutover activities. This plan will be created to include the specifics of the City of Coral Gables' design and implementation and presented at the Customer Design Review. This Final Cutover Plan, as reviewed and approved by The City of Coral Gables, will be performed following the Functional and Coverage Acceptance Tests (FATP and CATP). This process will yield a well-thought out, final Cutover Plan that is custom-tailored to the City of Coral Gables, with the City of Coral Gables' valued input and experience.

Project Documentation

Part of a successful system cutover is providing the proper documentation to the City of Coral Gables. As part of the closing efforts, Ci will provide the following documents:

Ci will provide system manuals, which will include the "As Built" documents for the system. These system manuals will include the following information:

- A final system configuration diagram with all equipment clearly identified

- Cabling Diagrams
- Tower and antenna system drawings
- All distribution frame and cross-connect wiring diagrams
- Final site layout drawings
- Recordings of all primary level settings and jumper locations
- Recordings of configuration parameters, where applicable
- Complete equipment inventory for each site by model and serial number
- Subscriber unit inventory by model and serial number
- IP Network addressing
- Acceptance test procedure results
- Channel/Frequency Plans
- Radio programming personality templates
- System alarm lists
- Site as-built documentation.
- Rack elevation drawings including equipment, cabling, and alarm definition.
- Equipment setup and alignment data.
- Signed test plans (FAT and System Acceptance Plan)
- Training material – radio, mobile, and P25 components including fleet mapping in the UAS.
- Equipment user manuals and CDs.

Punch List

All identified project related deficiencies during the execution of the various ATPs will be documented on a punch list form. The recording of these punch list items on a documented form will allow the Ci Project Manager and the City Program Director or designated representative to track any project related deficiencies and expedite satisfactory resolutions. The purpose of the project punch list is to document system deficiencies to be resolved prior to final acceptance. The appropriate forms (email and soft documents will be the standard) will be utilized to capture any identified punch list items.

Final Acceptance

Upon Ci delivering all the required documents associated with the final system documentation package, Ci will submit the final acceptance letter to the City of Coral Gables stating the system is ready for Final Acceptance and that Warranty can begin.

Equipment Decommissioning and Removal

Purpose and Scope

The decommissioning process is intended to be streamlined and efficient while ensuring the orderly removal of legacy communications systems, related expendables, and other communications equipment from the City of Coral Gables' sites.

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Ci and the City's project Management will jointly develop a Decommissioning Plan which will include inventory and identification of all legacy equipment to be removed, risk identification and management, and the final process and scheduling of the decommissioning and removal. This plan will delineate the manner in which the decommissioning requirements are applied for the legacy systems.

Decommissioning Review

When Ci's Field Integration Team is preparing for the implementation and commissioning of the Harris P25 IP radio system, Ci's technical personnel are also preparing for the decommissioning of the replaced legacy systems. As part of the deployment of the City of Coral Gables radio network, a facilities checklist will be required – this will aid Ci and the City in verifying which equipment, by site, is ready for decommissioning and removal. This checklist must be completed before the Legacy Systems and equipment can be deactivated/decommissioned.

Other areas evaluated during the decommissioning process will include identifying any test equipment to be returned to the City of Coral Gables, ensuring the City has received the final inventory data from the legacy system, preparing for transportation of equipment, and return of any usable spare components back to the City. Disposal instructions will also be provided to Ci by the City before the deactivation of the legacy system.

Decommissioning Procedure

- Identify all hardware, software, network devices, and non-IT equipment regardless of location or ownership. Activities include: development and population of an inventory and validation of assets, development and implementation of policies and procedures; and disposition of assets (including the decommissioning process).
- When the City grants permission to proceed with the removal process, remove all pre-identified equipment.
- Transport, store, and dispose of equipment as prescribed in the Decommissioning Plan.
- Provide the City with final decommissioning documentation (inventory, etc).

IMPLEMENTATION SUMMARY

Ci has extended experience in Implementation of small to extremely large projects throughout the entire world. Even though we appear to be located just in Florida, our real presence is to a wide range of customers that know and trust us throughout the industry. Our best recommendation is to "ask our existing customers" as provided in the referral section. You will find that Project Implementation, Customer Service, and Complete Satisfaction are our strongest attributes.

QUALIFICATIONS

Communications International, Inc. "Ci" started as a small company in Florida nearly 40 years ago. The concept was to offer a one-stop shop for the communication needs of the public safety and critical communications markets in the area.

Over the years we have grown to become an internationally recognized systems integrator of mission critical networks. Our experience covers many public safety, transit, and utility projects in the United States, Canada, Latin America and Caribbean. We have grown rapidly to become one of the premier system integrators in the United States.

Today, we are an employee owned company with 10 locations and nearly 200 employees; including Network Engineers, FCC licensed Technicians, IT Experts, Project Managers and Subject Matter Experts, to support clients across the U.S. and abroad.

Ci has been supporting public safety professionals to meet mission critical assignments. Our system designs, implementation and support services have developed strong, long-term relationships with public safety officials and end users who need dependable communications. These experiences have forged a proven methodology for implementing projects right the first time. Using standardized PMBOK™-based, project management tools and our field-proven project methodologies, the City of Coral Gables will receive a dependable Project Team for the success of their Public Safety Radio Communications System project.

Project team

Ci will organize a team of dedicated employees, capable and experienced to execute the requirements of the City of Coral Gables' Public Safety Radio Communications System project. This team will bring the knowledge and experience gained from implementing successful upgrade projects around the world. Ci will ensure the same level of excellent performance is delivered to the City of Coral Gables.

The Project Manager (PM) will lead the team and be responsible for all deliverables, ensuring a successful project. The Project Manager will coordinate resources and work assignments so that milestones are met in an efficient manner. Ci's dedicated project scheduler will support the Project Manager in preparing and updating the required project schedules and work plans.

The PM will have the organizational authority to execute the contract requirements for Ci and can access all necessary technical and management resources to support the proper execution of the contract. As prime system integrator, Ci acknowledges the role of managing subcontractor roles and responsibilities. The Project Manager will have global program level responsibilities with a focus on cost and schedules for

> **Ci Satisfied Customers**
>
> *Doing Project Management Right the First Time*
>
> "Ci has a dedicated team of professionals that has earned our respect through their due diligence when addressing any new project or endeavor"
>
> *Captain Thomas Labombardo, Aventura Police Department, Florida*

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all activities. All process compliance and completion of work to the satisfaction of the City of Coral Gables is the primary objective.

Staffing Plan

Ci has successfully staffed numerous programs of similar size, complexity and mission criticality as the the City of Coral Gables Public Safety Radio Communications System project. Ci will provide the City of Coral Gables the benefit of a local team of highly qualified experts to plan, monitor, and control every aspect of the Public Safety Radio Communications System project execution for a low-risk, high-quality, and on-time system delivery. With certified program management professionals, internal engineering resources and the combined strength of supplier partner of Harris Corporation, Ci offers to the City of Coral Gables the industry's top talent and a partnership to ensure the immediate and long-term success of the project. Additional value of the Ci team includes the following:

♦ The Ci Program Management Office and key management leaders will be closely aligned with the City of Coral Gables to facilitate effective relationship building with the City of Coral Gables and to maximize the level of coordination and communication needed to ensure project success.

♦ The Project Manager will be the sole points of contact to the City for program execution. This supports fast issue resolution, effective communications, accountability for commitments, and maintaining proper program priorities.

♦ Ci's local shop located in Tampa ensures that our team will have the benefit of an extensive range of local knowledge and experience.

Ci has established an experienced senior-level team, with years of relevant experience and proven expertise in the design, integration, deployment, and support of complex communications systems. Under the direction of our seasoned management and technical leaders, Ci brings to the City of Coral Gables assurance that the project will be completed on time and on budget, which meets their system and program objectives. Critical communications projects such as this require the coordinated efforts of a diverse, multi-disciplined team. This solid team is capable and ready to perform the tasks necessary to execute the project.

The Ci Engineering Team

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Design Team Members

Ci represents Harris as the largest Simulcast Integrator nationally and locally in the southeast. Ci's presence in multiple locations offers "next-door" support and continuity of the same project staff from project start. Ci is "A Trusted Pubic Safety Partner".

Your Ci Design Team:

♦   Steve Fisher, Chief System Engineer

♦   Matt St. Pierre, Project System Engineer

♦   Andrew Blankenship, Project System Engineer

♦   Hector Castro, Project Manager, PMP

♦   Matt Hinckle, Director of Sales

♦   John Rosati, Vice President of Sales and Marketing

♦   Mark Stanley, Vice President of Customer Advocacy

TRAINING SYSTEMS

Overview

Developing the knowledge and skills of the City of Coral Gables personnel who will operate and manage the new radio system are critical elements to successfully migrate to a P25^{IP} radio system. To perform these tasks, high-quality, performance-based training is required that builds and enhances personnel competence. In addition, training enables the City of Coral Gables to optimally use the features and capabilities of P25^{IP} to meet and exceed your communication requirements.

In order to provide high-quality, performance-based training, our training courses are developed and maintained using a systematic approach. This methodology identifies what training should be provided for each job position and focuses on the performance of tasks. Training courses are then designed and developed with explicit learning objectives and appropriate content. Training effectiveness is evaluated and the results are used to maintain and improve our training programs.

Comprehensive Training Program

- **Performance-based training**
- **Highly experienced and qualified training staff**
- **Facilitates the migration to a P25 radio system**
- **Qualified City of Coral Gables Sheriff's Office personnel**

The systematic approach to training methodology also ensures that training is delivered in the most effective learning environment, such as a classroom or laboratory, and a proper mixture of discussion, lecture, and hands-on training are used to provide for optimal learning. In addition, student materials that are easy to follow are created to support the training and appropriate technical documentation is provided.

Training for the City of Coral Gables will be delivered by our technical training staff that is comprised of training professionals with extensive experience in both telecommunications and adult learning. Instructor certification ensures that each trainer possesses the instructional skills and technical competencies to deliver high-quality training to our customers. Instructors are also evaluated regularly and they participate in a continuing instructor development program to maintain and improve their technical and instructional knowledge and skills. Instructors are assigned to conduct customer training based on their areas of expertise.

The Training Plan for the City of Coral Gables is divided into the following categories:

- System Manager Training
- Radio User Training
- Dispatcher Training
- Maintenance Technician Training

RELY ON Ci. WE'RE RIGHT THERE WITH YOU.

These categories define the training program for the City of Coral Gables personnel in distinct job classifications. Each category includes a description of the training, the course length, and timing of course delivery in relation to project implementation. The *Refresher Training* category includes operational refresher training for radio users and dispatch console operators using a web-based training solution.

1.   System Manager Training

System managers have the overall responsibility for defining and maintaining the system's configurable parameters. The importance of this role has increased significantly as communication systems have become larger and more complex. The responsibilities include the following:

- Defining the fleet map and associated properties

- Planning radio feature usage and personalities

- Developing operating procedures

- Maintaining unit and group databases

- Generating reports

- Controlling radios (e.g., enabling and disabling units), and

- Monitoring system performance

The system manager training program for the City of Coral Gables consists of on-site training, training attended at a Harris facility located in Lynchburg, Virginia or Las Vegas, Nevada, and an online course. The maximum class size for the on-site training is ten participants. Our proposal includes unit pricing to on-site training; attend standard training courses at a Harris facility and to complete the online course.

The following table lists the proposed courses for system managers and indicates whether the training is attended at a Harris training facility or conducted on site by stating the length of the training:

Figure 1. System Manager Training Program

Course/Workshop Name	Harris Facility	On-Site
P25^{IP} System Administration Course	4½ days	-
P25^{IP} Fleet Mapping Workshop	-	3 days
Unified Administration System Course	2 days	-
Regional Network Manager Course	2 days	-
Active Directory Course	Online (Self paced)	

Each student will receive a hardcopy of the training presentations, associated hands-on exercises, and applicable technical documentation. The following is a description of each course.

P25IP System Administration Course

This course is designed for system managers who will make decisions about the operation and configuration of the new P25^{IP} radio system. Upon completion of the training, system managers will be able to identify terminology, equipment, and components, and describe features and operational processes associated with a P25^{IP} radio system. The topics covered include system operation, fleet mapping, basic radio programming, system database configuration options, and implementation processes.

This course should be attended during the installation phase of the project.

P25^{IP} Fleet Mapping Workshop

This on-site workshop will assist the City of Coral Gables in defining the system fleet map. The advantages of different group structures and associated property, priority and coverage options are explored, and fleet mapping experience gained from other customers is shared. System configuration options (i.e., wide-area roaming, scanning, and emergency calls) are also examined.

This workshop should be conducted shortly after system managers attend the *P25^{IP} System Administration* course.

Unified Administration System Course

This course provides system managers with the ability to create and maintain system databases using the Unified Administration System (UAS). This hands-on course requires an understanding of the departments and agencies within the City as well as an operational understanding of the radio system. Therefore, completion of the *P25^{IP} System Administration* course is a prerequisite. Course topics include logging into the UAS, establishing user accounts, navigating through the user interface, creating and changing parameter values, adding/deleting radio users and talk groups, and configuring interoperability gateways.

This course should be attended during the latter stages of the installation phase of the project or shortly after cutover.

Regional Network Manager Course

This course provides system managers with the ability to monitor and manage the P25^{IP} radio system using the Regional Network Manager (RNM). Course topics include system access, monitoring the status of system equipment, identification and acknowledgement of system faults, historical views of system performance, exploring real-time viewers, and running activity and status reports on system performance.

This course should be attended during the latter stages of the installation phase of the project or shortly after cutover.

Active Directory Course

This online course introduces system managers to Active Directory, a hardware and software solution for network protection. Active Directory training includes how to control access to network components (e.g., servers, consoles, routers, etc.) using authentication tools and how to add network devices.

This course should be completed during the latter stages of the installation phase of the project or shortly after cutover.

2.   Radio User Training

The importance of radio users understanding basic system operation and the operation of their portable and/or mobile radios cannot be overstated. Ci /Harris provide radio user training based on a train-the-trainer approach.

In this approach, Ci/Harris provides model training and support materials for designated City of Coral Gables trainers to use during the implementation phase. Training on radio operation is scheduled for four hours and includes the following topics:

- An overview of the City of Coral Gables P25^{IP} radio system

- A description of system operation

- A discussion of radio/system coverage expectations

- A demonstration of radio operation, and

- Hands-on practice with the radios

Ci/Harris recommends that trainers are selected from the departments who will use the radio system. The trainers need to be familiar with current operations and aware of any operational issues. Additionally, Ci provides customized presentation material for the instructors as well as electronic copies of the training materials to allow for additional customization, if desired.

Ci/Harris will conduct a total of six train-the-trainer sessions over three consecutive days. Each session is limited to a maximum of 15 participants. This training will be conducted approximately two-to-four weeks prior to the start of the performance period to allow time for the instructors to practice using the equipment as well as to hold training sessions for their trainees. This training will be conducted at a facility provided by the City of Coral Gables and utilize Harris radios purchased and/or upgraded as part of the system.

3. Dispatcher Training

Dispatch personnel are at the core of effective and efficient implementation of a radio system. While the time required for training is minimal, the payback is immense.

Console Equipment Operating Training

This course provides dispatchers and supervisors with the knowledge and skills to operate their C3 MaestroIP Dispatch Console, Symphony Console, or Momentum Console, as applicable. The customer's operational consoles are utilized during this training. The training includes a discussion on the differences between conventional and trunked radio systems, if applicable, an overview of the customer's system, and basic system operation. The training is held in small groups with no more than two people on an operating console. This maximizes the effectiveness of the hands-on portion of the training. Each training session is four hours in length. Training on the VIP Console is offered through our web-based training program.

Console Configuration

This course provides dispatch supervisors and system administrators and managers with the knowledge and skills to configure the C3 MaestroIP or Symphony Dispatch Console including operational functions and screen layout. Participants learn how to setup the operation and layout of the console using the applicable configuration program.

4. Maintenance Technician Training

A P25 system maintenance technician must be familiar with all aspects of system operation and maintenance. This includes both site equipment and the VIDA IP network. System maintenance training provides technicians with the knowledge and skills needed to conduct preventive maintenance, troubleshoot problems, and take corrective action.

P25 System Maintenance

This course provides technicians with the basic knowledge and skills to operate and maintain a trunked P25 system. Course topics include an overview of P25 system operation, features, capabilities, and configurations, as well as basic radio programming. In addition, the function, configuration, and troubleshooting of system components are included.

Regional Network Manager

This course provides technicians with the ability to monitor and troubleshoot the system using the Regional Network Manager (RNM). Course topics include system access, monitoring the status of system equipment, identification and acknowledgement of system faults, historical views of system performance, exploring real-time viewers, and running activity and status reports on system performance.

Network Operation & Maintenance

This course introduces maintenance technicians to basic networking concepts and provides them with the ability to maintain the IP network and VIDA Application Server (VAS). Topics covered include IP addressing and basic routing, database backup and storage, router and switch configuration management, VAS configuration and failover operation, and disaster recovery of network components. Completion of the Regional Network Manager (YTSN3V) course is a prerequisite. Additionally, the Introduction to Networking (YTSN2X) course is a highly recommended prerequisite for individuals who have never had any formal network training.

MASTR V Station Maintenance

This course covers the theory of operation and maintenance procedures for the MASTR V Station used in the P25 radio system. Topics covered include station architecture, module overview, software overview, network configuration, station configuration, troubleshooting and testing. Completion of the P25 System Maintenance (YTSN6D) and Network Operation & Maintenance (YTSN3W) courses are a prerequisite.

UAC-Based Interoperability Gateway

This course is recommended for technicians and engineers who need the knowledge and skills to install and/or maintain an Interoperability Gateway. Participants learn how to configure a Universal Audio Card (UAC) to operate with legacy devices and the VIDA network. This includes an overview of the types of interfaces supported by the UAC, setting up and programming the UAC, configuring the system for UAC operation using the Unified Administration System (UAS) and Regional Network Manager (RNM), and performing audio alignments.

OMAP Portable Radio Maintenance

This course provides in-depth discussion and hands-on exercises to maintain Harris portable radios that utilize Open Multimedia Application Platform (OMAP) microprocessors. Students will participate in classroom presentations and discussions on radio programming for testing as well as radio personality modification to meet specific needs. Radio disassembly will be demonstrated and discussed, and replaceable parts and service tools will be identified. Hands-on exercises include radio programming, testing, and software maintenance.

OMAP Mobile Radio Maintenance

This course provides in-depth discussion and hands-on exercises to maintain Harris mobile radios that utilize Open Multimedia Application Platform (OMAP) microprocessors. Installation of the mobile radios, including the CH721 control unit, will be discussed. Students will participate in classroom presentations and discussions on radio programming for testing as well as personality modification to meet specific needs. Disassembly of the radios and the CH721 control unit will be demonstrated and discussed, and replaceable parts and service tools will be identified. Hands-on exercises include radio wiring installation, programming, testing, and software maintenance.

Active Directory

This online course introduces radio system administrators, managers, and technicians to Active Directory, a hardware and software solution for communication network protection. Active Directory training includes how to control access to network components such as dispatch consoles, servers, and routers by personnel using authentication tools, and how to add devices to the network.

5.   Refresher Training

The importance of ongoing training for radio users and dispatchers is paramount to smooth and effective operations. Web-based training provides a mechanism to effectively deliver refresher training for end users on radio and console operation. It can build the end users' confidence by improving their knowledge of system operation and skills to operate their communications equipment, which will enhance performance and reduce the number of trouble reports. Additionally, web-based training provides a resource to designated City of Coral Gables trainers who will conduct radio operational training for end users, and it can be used to augment training for new personnel due to turnover.

The web-based training program has numerous benefits that include the following:

- Training can be accessed whenever it is needed (24 hours a day, seven days a week) from any location that has access to the Internet.

- Courses are self-paced, highly interactive, and developed utilizing animation and other multimedia tools to help keep students engaged, which increases retention.

- It is cost-effective, especially when student or instructor travel and living expenses associated with attending standard classroom instruction are considered.

- Training delivery is consistent and structured to ensure learning objectives are met.

- A test is administered at the end of each course to measure student achievement of learning objectives.

- A learning content and management system makes it easy to track student progress and generate reports.

Ci/Harris's web-based training program consists of standard courses on radio and console operation as well as a *P25 System Overview* course, which was specifically designed for non-technical end users. This course includes topics such as the differences between analog and digital voice; basic multisite system operation; and factors that impact RF coverage.

Ci's proposal includes a one-year site license for unlimited access to the standard web-based training program for up to 500 students. Optional pricing is available if the City of Coral Gables wants to add more students to the program. The site license provides the City of Coral Gables with the following benefits:

- Students have access to <u>all</u> courses that are applicable to the City of Coral Gables system, which is beneficial to radio users who require training on both portable and mobile radios.

- Courses can be added to City of Coral Gables' training program at no additional cost if the City of Coral Gables purchases other radio models during the term of the license. For example, four months into the term of the site license the City of Coral Gables decides to buy Unity XG-100P portable radios. Ci/Harris will add this course to the City of Coral Gables training program at no additional cost.

- Newly developed courses can be added to your training program at no additional cost during the term of the license if the courses are applicable to the City of Coral Gables system.

- Ci will provide a designated City of Coral Gables individual with administrative rights to the Learning Content and Management System so that agencies can directly monitor student activity and progress in completing courses, and generate reports.

The one-year site license is renewable on an annual basis with a significant discount based on the total number of students. Each student will require a unique e-mail address in order to register and enroll in the training. If the City of Coral Gables desires any course to be customized, a quotation can be provided on a case-by-case basis.

Summary

The comprehensive training program proposed and recommended for the City of Coral Gables involves personnel from various agencies and at many levels. We envision a program that facilitates the transition to a P25^{IP} radio system and builds the foundation for long-term excellence. Wide participation and in-depth instruction reflect our commitment to delivering an outstanding training program.

PRICING

Quote

COMMUNICATIONS INTERNATIONAL
Rely on Ci.

Date:	January 15, 2015
Valid Until	January 31, 2015
Quote #:	SWF121214REVE
Customer ID:	CGables

Customer:

City Of Coral Gables

Quote/Project Description

Upgrade 800 MHZ Radio System to P25 Phase 2.
Upgrade Microwave System to 45 MBS Redundant Hot
Standby. Upgrade and Replace Terminals for P25 Operation

Presented by:

Matt Hinckle	Director of Sales
Steve Fisher	Chief Engineer

Proposal Summary Revised 1/9/14

Item	Quantity	Model	Description	Unit Sale	Extended Sale
1	1	Harris	P25 Phase 2 System Equipment & Services	$ 3,540,049.97	$ 3,540,049.97
2	1	MNI	11 GHZ 45 MBS Microwave Dual Redundant Radio System w Fiber Routers	$ 437,053.24	$ 437,053.24
3	1	Harris	Terminal Equipment Replacement and Upgrades	$ 2,489,799.62	$ 2,489,799.62
			Sub Total		$ 6,466,902.83
			Performance Bond Costs		$ 100,000.00
5	1		Extended System Discount		$ (720,000.00)

Special Notes and Instructions

Total	$ 5,846,902.83

OPTIONS

Quote subject to Ci standard terms and conditions.

Submit Purchase Order to:

  Communications International

  4450 US Highway 1

  Vero Beach, FL 32967

  www.ask4ci.com

Quote accepted:

_____ _____

Signature   Date

_____ _____

Print Name   Title

Coral Gables P25 System Upgrade

1/9/2015

Units	Description	Unit		Extended
1	Harris HA VIDA Core HA Network Switching Core Hardware Redundant	$	416,682.36 $	416,682.36
	Includes			
	SERVER, REDUNDANT PREMIER NSC,VMWARE			
	LICENSE,HA,HARDWARE,NSC			
	LICENSE,P25 APPLICATION			
	LICENSE,NETWORK FIRST APPLICATION			
	PACKAGE,BEON,FOUNDATION,+25 USERS			
	STORAGE ARRAY NETWORK, NETAPP SAN			
	ROUTER,2921,AC,L3 SWITCH MDL,NO ENCRYPT			
	Firewall, Cisco ASA 5505			
	LICENSE,CONSOLE			
	LICENSE,CONSOLE TALKPATH			
	LICENSE,P25 SITE			
	LICENSE,P25 SITE TALKPATH			
	LICENSE,NETWORK FIRST SITE			
	LICENSE,NETWORK FIRST TALKPATH			
	LICENSE,NSS,IP LOGGING RECORDER			
	LICENSE,NSS,IP LOGGING RECORDER TALKPATH			
1	Harris Network First Conventional Interop Gateway	$	142,232.39 $	142,232.39
	Includes			
	32 Channel Conventional Interop Equipment			
1	Eight Harris Symphony Premier Dispatch Consoles w AES and Conventional Controls	$	331,619.89 $	331,619.89
	Includes			
	CONSOLE,SYMPHONY,BUNDLE,PREMIER			
	LICENSE,AES LEVEL ENCRYPTION			
	LICENSE,CONVENTIONAL CONTROLS			
	License P25,Vocoder			
	SPEAKER, NANO, SYMPHONY			
	MONITOR, 21.5" CLASS,TOUCHSCREEN,HD			
	SINGLE FOOTSWITCH, USB, SYMPHONY			
	SINGLE FOOTSWITCH, USB, SYMPHONY			
	DESK MIC, DB9			
	JACK BOX, 6 WIRE			
1	Four Harris Symphony Premier Dispatch Consoles w AES and Conventional Controls	$	165,394.64 $	165,394.64
	Includes			
	CONSOLE,SYMPHONY,BUNDLE,PREMIER			
	LICENSE,AES LEVEL ENCRYPTION			
	LICENSE,CONVENTIONAL CONTROLS			
	License P25,Vocoder			
	SPEAKER, NANO, SYMPHONY			
	MONITOR, 21.5" CLASS,TOUCHSCREEN,HD			
	SINGLE FOOTSWITCH, USB, SYMPHONY			
	SINGLE FOOTSWITCH, USB, SYMPHONY			
	DESK MIC, DB9			
	JACK BOX, 6 WIRE			

1	Harris 3 Site 10 Channel P25 GPS IP Linear Simulcast System w Redundant IP Control Point	$	1,025,226.84	$	1,025,226.84
	Includes				
	Mastr V Linear Simulcast Stations w Enhanced Dual Mode Phase 1 and Phase 2 Operation				
1	Harris 8 Talkpath EDACS Migration Gateway	$	40,845.75	$	40,845.75
1	Simulcast System Antennas and Mounting Hardware	$	86,962.78	$	86,962.78
1	DB Spectra Transmit Combiners, TTA's and Multicouplers	$	92,589.56	$	92,589.56
1	Coaxial Cable, Connectors and Hardware	$	32,109.55	$	32,109.55
1	MCM Terminal Management Software w 2 years of Services	$	78,028.03	$	78,028.03
1	Recommended Harris Equipment Spares	$	134,515.78	$	134,515.78
1	Installation Services System Staging	$	169,625.00	$	169,625.00
1	Installation Services Simulcast System	$	149,033.50	$	149,033.50
1	Installation Services VIDA Core -NSC	$	111,653.40	$	111,653.40
1	Installation Services Dispatch Consoles	$	85,415.50	$	85,415.50
1	Installation Services Optimization and Testing	$	43,416.00	$	43,416.00
1	Tower Crew Services	$	58,276.00	$	58,276.00
1	Project Management	$	91,075.00	$	91,075.00
1	Systems Engineering	$	125,235.00	$	125,235.00
1	Harris Factory Training	$	105,075.00	$	105,075.00
1	Training Travel Expenses	$	38,750.00	$	38,750.00
1	Removal and Disposal of Old EDACS Equipment	$	16,288.00	$	16,288.00
	Note: Coral Gables is responsible for the storage of any removed equipment				
	Total for P25 System Upgrade			**$**	**3,540,049.97**

Coral Gables 11 GHZ Microwave and Fiber Upgrade

Units	Description	Unit		Extended
1	Three Links of 11 GHZ High Power MNI Proteux MX 45 Mbs Ethernet Microwave w DS 1	$ 124,696.25	$	124,696.25
	Includes All Indoor Dual Monitored Hot Standby Radios			
1	MNI Microwave Network System Manager Terminal & Software	$ 15,032.99	$	15,032.99
1	Two Alcatel SARS 8 MPLS Fiber Optic Router w 16 T1 Interface and Gig E Ethernet	$ 26,899.72	$	26,899.72
1	Microwave Antenna Systems	$ 49,535.77	$	49,535.77
1	Eltek DC Power Battery Plants for Microwave Sites (4 Power Plants)	$ 15,446.74	$	15,446.74
1	Microwave License Modifications	$ 4,500.00	$	4,500.00
1	Tower Crew Services	$ 51,165.00	$	51,165.00
1	Microwave & Fiber Recommended Spares	$ 30,840.00	$	30,840.00
1	Ci Installation, Engineering and Project Management Services	$ 118,936.77	$	118,936.77
	Total for Microwave System Upgrades		$	**437,053.24**

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Coral Gables P25 User Equipment

12/7/2014

Police High Tier Rear Mount XG-75M Mobile

Qty	Part Number	Description	Unit List	Ext List	Discount	Unit sale	Ext sale
141	MAMW-SDMXX	MOBILE,XG-75M/M7300,764-870MHZ,HALF DPLX	$ 2,300.00	$ 324,300.00	28%	$ 1,656.00	$ 233,496.00
141	MAMW-NPL3R	Feature,Max(1024+) System/Groups	$ 0.01	$ 1.41	0%	$ 0.01	$ 1.41
141	MW-PL4U	Feature, Single-Key DES Encryption	$ 0.01	$ 1.41	0%	$ 0.01	$ 1.41
141	MW-PRO	FEATURE, PROVOICE	$ 250.00	$ 35,250.00	28%	$ 180.00	$ 25,380.00
141	MAMW-PKGED	Feature Package,EDACS Trunking	$ 1,100.00	$ 155,100.00	28%	$ 792.00	$ 111,672.00
141	MW-PL4F	Feature, P25 Phase 2, TDMA	$ 250.00	$ 35,250.00	28%	$ 180.00	$ 25,380.00
141	MAMW-PKGPT	Feature Package,P25 Trunking	$ 1,100.00	$ 155,100.00	100%	$ -	$ -
141	MAMW-NPL7M	Feature,256-AES,ECP Encryption	$ 495.00	$ 69,795.00	28%	$ 356.40	$ 50,252.40
141	MAMW-NCP9E	Control Unit,CH721,Scan,Remote Mount	$ 720.00	$ 101,520.00	28%	$ 518.40	$ 73,094.40
141	MAMW-NZN7R	ACCESSORIES,XG-75M/M7300 REMOTE MOUNT	$ 360.00	$ 50,760.00	28%	$ 259.20	$ 36,547.20
141	MAMW-NMC7Z	MICROPHONE,STD,STRAIGHT CONNECTOR	$ 80.00	$ 11,280.00	28%	$ 57.60	$ 8,121.60
141	AN-225001-004	Antenna,Element,700/800 2dB Low ProFile	$ 60.00	$ 8,460.00	28%	$ 43.20	$ 6,091.20
141	AN-125001-002	Antenna,Base,Standard Roof Mnt Low Loss	$ 80.00	$ 11,280.00	28%	$ 57.60	$ 8,121.60
						$ 4,100.42	$ 578,159.22

Fire High Tier Rear Mount XG-75M Mobile

Qty	Part Number	Description	Unit List	Ext List	Discount	Unit sale	Ext sale
7	MAMW-SDMXX	MOBILE,XG-75M/M7300,764-870MHZ,HALF DPLX	$ 2,300.00	$ 16,100.00	28%	$ 1,656.00	$ 11,592.00
7	MAMW-NPL3R	Feature,Max(1024+) System/Groups	$ 0.01	$ 0.07	0%	$ 0.01	$ 0.07
7	MW-PL4U	Feature, Single-Key DES Encryption	$ 0.01	$ 0.07	0%	$ 0.01	$ 0.07
7	MW-PRO	FEATURE, PROVOICE	$ 250.00	$ 1,750.00	28%	$ 180.00	$ 1,260.00
7	MAMW-PKGED	Feature Package,EDACS Trunking	$ 1,100.00	$ 7,700.00	28%	$ 792.00	$ 5,544.00
7	MAMW-PKGPT	Feature Package,P25 Trunking	$ 1,100.00	$ 7,700.00	100%	$ -	$ -
7	MW-PL4F	Feature, P25 Phase 2, TDMA	$ 250.00	$ 1,750.00	28%	$ 180.00	$ 1,260.00
7	MAMW-NCP9E	Control Unit,CH721,Scan,Remote Mount	$ 720.00	$ 5,040.00	28%	$ 518.40	$ 3,628.80
7	MAMW-NZN7R	ACCESSORIES,XG-75M/M7300 REMOTE MOUNT	$ 360.00	$ 2,520.00	28%	$ 259.20	$ 1,814.40
7	MAMW-NMC7Z	MICROPHONE,STD,STRAIGHT CONNECTOR	$ 80.00	$ 560.00	28%	$ 57.60	$ 403.20
7	AN-225001-004	Antenna,Element,700/800 2dB Low ProFile	$ 60.00	$ 420.00	28%	$ 43.20	$ 302.40
7	AN-125001-002	Antenna,Base,Standard Roof Mnt Low Loss	$ 80.00	$ 560.00	28%	$ 57.60	$ 403.20
						$ 3,744.02	$ 26,208.14

Police High Tier Rear Mount XG-75M Mobile w HHC Controller

Qty	Part Number	Description	Unit List	Ext List	Discount	Unit sale	Ext sale
58	MAMW-SDMXX	MOBILE,XG-75M/M7300,764-870MHZ,HALF DPLX	$ 2,300.00	$ 133,400.00	28%	$ 1,656.00	$ 96,048.00
58	MAMW-NPL3R	Feature,Max(1024+) System/Groups	$ 0.01	$ 0.58	0%	$ 0.01	$ 0.58
58	MW-PL4U	Feature, Single-Key DES Encryption	$ 0.01	$ 0.58	0%	$ 0.01	$ 0.58
58	MAMW-PKGED	Feature Package,EDACS Trunking	$ 1,100.00	$ 63,800.00	28%	$ 792.00	$ 45,936.00
58	MAMW-PKGPT	Feature Package,P25 Trunking	$ 1,100.00	$ 63,800.00	100%	$ -	$ -
58	MW-PL4F	Feature, P25 Phase 2, TDMA	$ 250.00	$ 14,500.00	28%	$ 180.00	$ 10,440.00
58	MAMW-NPL7M	Feature,256-AES,ECP Encryption	$ 495.00	$ 28,710.00	28%	$ 356.40	$ 20,671.20
58	MAMW-NCP9P	CONTROL UNIT, HHC-731, XG-75M/M7300	$ 685.00	$ 39,730.00	28%	$ 493.20	$ 28,605.60
58	MAMW-NZN9G	Kit,HHC-731,Installation Accessories	$ 340.00	$ 19,720.00	28%	$ 244.80	$ 14,198.40
58	MAMW-NMC7Z	MICROPHONE,STD,STRAIGHT CONNECTOR	$ 80.00	$ 4,640.00	28%	$ 57.60	$ 3,340.80
58	AN-225001-004	Antenna,Element,700/800 2dB Low ProFile	$ 60.00	$ 3,480.00	28%	$ 43.20	$ 2,505.60
58	AN-125001-002	Antenna,Base,Standard Roof Mnt Low Loss	$ 80.00	$ 4,640.00	28%	$ 57.60	$ 3,340.80
						$ 3,880.82	$ 225,087.56

Fire High Tier Rear Mount XG-75M Mobile w HHC Controller

Qty	Part Number	Description	Unit List	Ext List	Discount	Unit sale	Ext sale
14	MAMW-SDMXX	MOBILE,XG-75M/M7300,764-870MHZ,HALF DPLX	$ 2,300.00	$ 32,200.00	28%	$ 1,656.00	$ 23,184.00
14	MAMW-NPL3R	Feature,Max(1024+) System/Groups	$ 0.01	$ 0.14	0%	$ 0.01	$ 0.14
14	MW-PL4U	Feature, Single-Key DES Encryption	$ 0.01	$ 0.14	0%	$ 0.01	$ 0.14
14	MAMW-PKGED	Feature Package,EDACS Trunking	$ 1,100.00	$ 15,400.00	28%	$ 792.00	$ 11,088.00

209

Qty	Part Number	Description	Unit List		Ext List	Discount	Unit sale		Ext sale
14	MW-PL4F	Feature, P25 Phase 2, TDMA	$	250.00	$ 3,500.00	28%	$ 180.00	$	2,520.00
14	MAMW-PKGPT	Feature Package,P25 Trunking	$	1,100.00	$ 15,400.00	100%	$ -	$	-
14	MAMW-NCP9P	CONTROL UNIT, HHC-731, XG-75M/M7300	$	685.00	$ 9,590.00	28%	$ 493.20	$	6,904.80
14	MAMW-NZN9G	Kit,HHC-731,Installation Accessories	$	340.00	$ 4,760.00	28%	$ 244.80	$	3,427.20
14	MAMW-NMC7Z	MICROPHONE,STD,STRAIGHT CONNECTOR	$	80.00	$ 1,120.00	28%	$ 57.60	$	806.40
14	AN-225001-004	Antenna,Element,700/800 2dB Low ProFile	$	60.00	$ 840.00	28%	$ 43.20	$	604.80
14	AN-125001-002	Antenna,Base,Standard Roof Mnt Low Loss	$	80.00	$ 1,120.00	28%	$ 57.60	$	806.40
							$ 3,524.42	$	49,341.88

Police Multiband Rear Mount XG 100M Mobile

Qty	Part Number	Description	Unit List		Ext List	Discount	Unit sale		Ext sale
15	XM-100F	Mobile,XG-100M,136-870MHz,Unencrypted	$	4,010.00	$ 60,150.00	28%	$ 2,887.20	$	43,308.00
15	XMPL4F	Feature,Phase II TDMA	$	250.00	$ 3,750.00	28%	$ 180.00	$	2,700.00
15	XMPL4C	Feature Package,P25 Encryption	$	695.00	$ 10,425.00	28%	$ 500.40	$	7,506.00
15	XMPRO	FEATURE, PROVOICE	$	250.00	$ 3,750.00	28%	$ 180.00	$	2,700.00
15	XM-P25ED	FEATURE PACKAGE,P25 TRUNKING & EDACS	$	2,000.00	$ 30,000.00	28%	$ 1,440.00	$	21,600.00
15	XMCP9F	Control Unit,CH721,System,Remote Mount	$	825.00	$ 12,375.00	28%	$ 594.00	$	8,910.00
15	XMZN7R	Accessories,Unity,Remote Mount	$	360.00	$ 5,400.00	28%	$ 259.20	$	3,888.00
15	XMMC7Z	MICROPHONE,STD,CH100,STRAIGHT CONNECTOR	$	80.00	$ 1,200.00	28%	$ 57.60	$	864.00
15	XMAN6H	Antenna,Elmt,Mlti Bnd,136-870MHz 0dB	$	180.00	$ 2,700.00	28%	$ 129.60	$	1,944.00

Qty	Part Number	Description	Unit List		Ext List	Discount	Unit sale		Ext sale
15	AN-125001-002	Antenna,Base,Standard Roof Mnt Low Loss	$	80.00	$ 1,200.00	28%	$	57.60	$ 864.00
							$	6,285.60	$ 94,284.00

Fire Multiband Dual Head Rear Mount XG 100M Mobile

Qty	Part Number	Description	Unit List		Ext List	Discount	Unit sale		Ext sale
11	XM-100F	Mobile,XG-100M,136-870MHz,Unencrypted	$	4,010.00	$ 44,110.00	28%	$	2,887.20	$ 31,759.20
11	XMPL4F	Feature,Phase II TDMA	$	250.00	$ 2,750.00	28%	$	180.00	$ 1,980.00
11	XMPRO	FEATURE, PROVOICE	$	250.00	$ 2,750.00	28%	$	180.00	$ 1,980.00
11	XM-P25ED	FEATURE PACKAGE,P25 TRUNKING & EDACS	$	2,000.00	$ 22,000.00	28%	$	1,440.00	$ 15,840.00
11	XMCP9F	Control Unit,CH721,System,Remote Mount	$	825.00	$ 9,075.00	28%	$	594.00	$ 6,534.00
11	XMZN7R	Accessories,Unity,Remote Mount	$	360.00	$ 3,960.00	28%	$	259.20	$ 2,851.20
11	XMMC7Z	MICROPHONE,STD,CH100,STRAIGHT CONNECTOR	$	80.00	$ 880.00	28%	$	57.60	$ 633.60
11	XMZN7D	Control Unit,2-6,CH-721 Sys w/Instl Hdwr	$	1,220.00	$ 13,420.00	28%	$	878.40	$ 9,662.40
11	XMMC7Z	MICROPHONE,STD,CH100,STRAIGHT CONNECTOR	$	80.00	$ 880.00	28%	$	57.60	$ 633.60
11	XMAN6H	Antenna,Elmt,Mlti Bnd,136-870MHz 0dB	$	180.00	$ 1,980.00	28%	$	129.60	$ 1,425.60
11	AN-125001-002	Antenna,Base,Standard Roof Mnt Low Loss	$	80.00	$ 880.00	28%	$	57.60	$ 633.60
11	XMAN5F	Antenna,GPS,Roof Mount	$	155.00	$ 1,705.00	28%	$	111.60	$ 1,227.60
							$	6,832.80	$ 75,160.80

Local Government Mid Tier Rear Mount XG-25M Mobile

Qty	Part Number	Description	Unit List		Ext List	Discount	Unit sale		Ext sale
44	DM-M78B	MOBILE,XG-25M,700/800 MHZ,35W	$	2,100.00	$ 92,400.00	28%	$	1,512.00	$ 66,528.00
44	DM-PL7Z	Feature,512 Systems/Groups	$	0.01	$ 0.44	0%	$	0.01	$ 0.44
44	DM-PL4U	Feature, Single-Key DES Encryption	$	0.01	$ 0.44	0%	$	0.01	$ 0.44
44	DM-PL4F	Feature, P25 Phase 2, TDMA	$	250.00	$ 11,000.00	28%	$	180.00	$ 7,920.00
44	DM-PKGPT	Feature Package,P25 Trunking	$	750.00	$ 33,000.00	100%	$	-	$ -
44	DM-PRO	FEATURE, PROVOICE	$	250.00	$ 11,000.00	28%	$	180.00	$ 7,920.00
44	DM-PKGED	FEATURE PACKAGE, EDACS TRUNKING	$	750.00	$ 33,000.00	28%	$	540.00	$ 23,760.00
44	DM-ZN9Z	KIT, CONVERSION, CH-25 REM CTRL HD, 30FT	$	450.00	$ 19,800.00	28%	$	324.00	$ 14,256.00
44	DM-ZN9X	Kit,Accessories,XG-25M	$	195.00	$ 8,580.00	28%	$	140.40	$ 6,177.60
44	DM-MC9R	Microphone,Standard,XG-25M	$	80.00	$ 3,520.00	28%	$	57.60	$ 2,534.40
44	AN-225001-004	Antenna,Element,700/800 2dB Low ProFile	$	60.00	$ 2,640.00	28%	$	43.20	$ 1,900.80
44	AN-125001-002	Antenna,Base,Standard Roof Mnt Low Loss	$	80.00	$ 3,520.00	28%	$	57.60	$ 2,534.40
							$	3,034.82	$ 133,532.08

Police & LG High Tier Portable Scan XG-75P

Qty	Part Number	Description	Unit List		Ext List	Discount	Unit sale		Ext sale
88	EVXG-PB78B	PORTABLE,XG-75,764-870MHZ,SCAN,BLK-GRY	$	1,970.00	$ 173,360.00	28%	$	1,418.40	$ 124,819.20
88	MAEV-NPL3R	Feature,Max(1024+) System/Groups	$	0.01	$ 0.88	0%	$	0.01	$ 0.88
88	EV-PL4U	Feature, Single-Key DES Encryption	$	0.01	$ 0.88	0%	$	0.01	$ 0.88
88	EV-PRO	FEATURE, PROVOICE	$	250.00	$ 22,000.00	28%	$	180.00	$ 15,840.00
88	MAEV-PKGED	Feature Package,EDACS Trunking	$	1,100.00	$ 96,800.00	28%	$	792.00	$ 69,696.00
88	EVXG-NPL4F	Feature, P25 PHASE 2 TDMA	$	250.00	$ 22,000.00	28%	$	180.00	$ 15,840.00
88	MAEV-PKGPT	Feature Package,P25 Trunking	$	1,100.00	$ 96,800.00	100%	$	-	$ -
88	MAEV-NPL7M	Feature,256-AES Encryption	$	495.00	$ 43,560.00	28%	$	356.40	$ 31,363.20
88	EV-PA3R	BATTERY,LI-ION,2400 MAH	$	80.00	$ 7,040.00	28%	$	57.60	$ 5,068.80
88	MAEV-NNC5X	Antenna,764-870MHz,1/4 Wave Whip	$	40.00	$ 3,520.00	28%	$	28.80	$ 2,534.40
88	MAEV-NHC2G	Belt Clip,Standard,P7300	$	20.00	$ 1,760.00	28%	$	14.40	$ 1,267.20
							$	3,027.62	$ 266,430.56

Fire High Tier Portable Scan XG-75P

Qty	Part Number	Description	Unit List		Ext List	Discount	Unit sale		Ext sale
121	EVXG-PB78Y	PORTABLE,XG-75,764-870MHZ,SCAN,BLK-YEL	$	1,995.00	$ 43,400.00	28%	$	1,436.40	$ 173,804.40
121	MAEV-NPL3R	Feature,Max(1024+) System/Groups	$	0.01	$ 0.20	0%	$	0.01	$ 1.21
121	EV-PL4U	Feature, Single-Key DES Encryption	$	0.01	$ 0.20	0%	$	0.01	$ 1.21
121	EV-PRO	FEATURE, PROVOICE	$	250.00	$ 5,000.00	28%	$	180.00	$ 21,780.00
121	EVXG-NPL4F	Feature, P25 PHASE 2 TDMA	$	250.00	$ 22,000.00	28%	$	180.00	$ 21,780.00
121	MAEV-PKGPT	Feature Package,P25 Trunking	$	1,100.00	$ 22,000.00	28%	$	-	$ -
121	MAEV-PKGED	Feature Package,EDACS Trunking	$	1,100.00	$ 5,000.00	100%	$	792.00	$ 95,832.00
121	EV-PA3R	BATTERY,LI-ION,2400 MAH	$	80.00	$ 9,900.00	28%	$	57.60	$ 6,969.60
121	MAEV-NNC5X	Antenna,764-870MHz,1/4 Wave Whip	$	40.00	$ 1,600.00	28%	$	28.80	$ 3,484.80
121	MAEV-NHC2G	Belt Clip,Standard,P7300	$	20.00	$ 800.00	28%	$	14.40	$ 1,742.40
							$	2,689.22	$ 325,395.62

Police High Tier Portable System XG-75P

Qty	Part Number	Description	Unit List	Ext List	Discount	Unit sale	Ext sale
20	EVXG-PF78B	PORTABLE,XG-75,764-870MHZ,SYS,BLK-GRY	$ 2,170.00	$ 43,400.00	28%	$ 1,562.40	$ 31,248.00
20	MAEV-NPL3R	Feature,Max(1024+) System/Groups	$ 0.01	$ 0.20	0%	$ 0.01	$ 0.20
20	EV-PL4U	Feature, Single-Key DES Encryption	$ 0.01	$ 0.20	0%	$ 0.01	$ 0.20
20	EV-PRO	FEATURE, PROVOICE	$ 250.00	$ 5,000.00	28%	$ 180.00	$ 3,600.00
20	MAEV-PKGED	Feature Package,EDACS Trunking	$ 1,100.00	$ 22,000.00	28%	$ 792.00	$ 15,840.00
20	MAEV-PKGPT	Feature Package,P25 Trunking	$ 1,100.00	$ 22,000.00	100%	$ -	$ -
20	EVXG-NPL4F	Feature, P25 PHASE 2 TDMA	$ 250.00	$ 5,000.00	28%	$ 180.00	$ 3,600.00
20	MAEV-NPL7M	Feature,256-AES Encryption	$ 495.00	$ 9,900.00	28%	$ 356.40	$ 7,128.00
20	EV-PA3R	BATTERY,LI-ION,2400 MAH	$ 80.00	$ 1,600.00	28%	$ 57.60	$ 1,152.00
20	MAEV-NNC5X	Antenna,764-870MHz,1/4 Wave Whip	$ 40.00	$ 800.00	28%	$ 28.80	$ 576.00
20	MAEV-NAE6A	SPEAKERMIC,COILED	$ 160.00	$ 3,200.00	28%	$ 115.20	$ 2,304.00
20	MAEV-NHC2G	Belt Clip,Standard,P7300	$ 20.00	$ 400.00	28%	$ 14.40	$ 288.00
						$ 3,286.82	$ 65,736.40

Local Government Mid Tier Portable System XG-25P

Qty	Part Number	Description	Unit List	Ext List	Discount	Unit sale	Ext sale
7	DPXG-PF78B	Portable,XG-25P,764-870MHz,System	$ 1,200.00	$ 8,400.00	28%	$ 864.00	$ 6,048.00
7	DP-PL7Z	Feature,512 Systems/Groups	$ 0.01	$ 0.07	0%	$ 0.01	$ 0.07
7	DP-PL4U	Feature, Single-Key DES Encryption	$ 0.01	$ 0.07	0%	$ 0.01	$ 0.07
7	DP-PRO	FEATURE, PROVOICE	$ 250.00	$ 1,750.00	28%	$ 180.00	$ 1,260.00
7	DP-PKGED	FEATURE PACKAGE, EDACS TRUNKING	$ 750.00	$ 5,250.00	28%	$ 540.00	$ 3,780.00
7	DP-PKGPT	Feature Package,P25 Trunking	$ 750.00	$ 5,250.00	100%	$ -	$ -
7	DP-PL4F	Feature,P25 Phase 2, TDMA	$ 250.00	$ 1,750.00	28%	$ 180.00	$ 1,260.00
7	DP-PA3R	BATTERY,LI-ION,2400 MAH	$ 80.00	$ 560.00	28%	$ 57.60	$ 403.20
7	DP-NC5X	Antenna,764-870MHz,1/4 Wave Whip	$ 40.00	$ 280.00	28%	$ 28.80	$ 201.60
7	DP-HC7P	Belt Clip,Metal	$ 20.00	$ 140.00	28%	$ 14.40	$ 100.80
						$ 1,864.82	$ 13,053.74

Mid Tier Portable Scan XG-25P

Qty	Part Number	Description	Unit List	Ext List	Discount	Unit sale	Ext sale
65	DPXG-PB78B	Portable,XG-25P,764-870MHz,Scan	$ 1,100.00	$ 71,500.00	28%	$ 792.00	$ 51,480.00
65	DP-PL7Z	Feature,512 Systems/Groups	$ 0.01	$ 0.65	0%	$ 0.01	$ 0.65
65	DP-PL4U	Feature, Single-Key DES Encryption	$ 0.01	$ 0.65	0%	$ 0.01	$ 0.65
65	DP-PRO	FEATURE, PROVOICE	$ 250.00	$ 16,250.00	28%	$ 180.00	$ 11,700.00
65	DP-PKGED	FEATURE PACKAGE, EDACS TRUNKING	$ 750.00	$ 48,750.00	28%	$ 540.00	$ 35,100.00
65	DP-PA3R	BATTERY,LI-ION,2400 MAH	$ 80.00	$ 5,200.00	28%	$ 57.60	$ 3,744.00
65	DP-PKGPT	Feature Package,P25 Trunking	$ 750.00	$ 48,750.00	100%	$ -	$ -
65	DP-PL4F	Feature,P25 Phase 2, TDMA	$ 250.00	$ 16,250.00	28%	$ 180.00	$ 11,700.00
65	DP-NC5X	Antenna,764-870MHz,1/4 Wave Whip	$ 40.00	$ 2,600.00	28%	$ 28.80	$ 1,872.00
65	DP-HC7P	Belt Clip,Metal	$ 20.00	$ 1,300.00	28%	$ 14.40	$ 936.00
						$ 1,792.82	$ 116,533.30

Radio Accessories

Qty	Part Number	Description	Unit List	Ext List	Discount	Unit sale	Ext sale
245	MAEV-NAE6A	SPEAKERMIC,COILED	$ 160.00	$ 39,200.00	28%	$ 115.20	$ 28,224.00
245	MAEV-NCH9T	Charger,Single,Tri-Chem	$ 120.00	$ 29,400.00	28%	$ 86.40	$ 21,168.00
9	DP-AE6A	Speaker Mic,Coiled	$ 160.00	$ 1,440.00	28%	$ 115.20	$ 1,036.80
35	DP-CH4G	CHARGER,SINGLE BAY,TRI-CHEMISTRY,XG-25P	$ 120.00	$ 4,200.00	28%	$ 86.40	$ 3,024.00
10	DP-CH4H	Charger,6-Bay,Tri-Chemistry,XG-25P	$ 695.00	$ 6,950.00	28%	$ 500.40	$ 5,004.00
57	CI Special	Horn Light Relay Interface	$ 488.00	$ 27,816.00	28%	$ 351.36	$ 20,027.52
							$ 78,484.32

Upgrade of Existing Radio Features

Qty	Part Number	Description	Unit List	Ext List	Discount	Unit sale	Ext sale
186	YR-P25T-2	P25 Feature Upgrade to Existing Portables	$ 1,100.00	$ 204,600.00	28%	$ 792.00	$ 147,312.00
167	YR-P25T-2	P25 Feature Upgrade to Existing Mobile	$ 1,100.00	$ 183,700.00	28%	$ 792.00	$ 132,264.00

Total for P25 Feature Upgrades $ 279,576.00

Installation Services for Mobile Terminals $ 162,816.00

Total for User Terminal Equipment and Services $ 2,489,799.62

Notes.　　　**Services Pricing based on Coral Gables Radio Shop Performing the Following Functions**

QTY　　　　Description

279　　　　Program & Setup Mobile Radios and Document

301　　　　Program & Setup Portable Radios and Document

　28　　　　Program & Setup Control Station Radios and Document

　11　　　　Program & Setup Dual Control Mobile and Document

186　　　　Feature Upgrade Existing Mobile-Reflash Code-Program & Document

167　　　　Feature Upgrade Existing Portables-Reflash Code- Program & Document

　　　　　　CI will work with Coral Gables to develop Radio Profiles and Programs

　　　　　　CI will Install all Control Stations and Mobile radios

　　　　　　Harris 2 Year Radio warranty will start once units are placed into service or apon system acceptance

　　　　　　Which ever comes first