Futurecom Systems Group, ULC

a Motorola Solutions Company

PDR8000® Portable Digital Repeater Connectivity Deployment Application Note

Note: PDR8000® is sold exclusively by Motorola Solutions, Inc. worldwide

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Proprietary Statement

Contents

Figures:

1. Introduction

Agencies with personnel in the field requiring two-way digital radio (voice and data) communication with the ASTRO® system or cross-agency can now extend the PDR8000 Portable Digital Repeater's V.24 interface over telephone or IP communication networks.

Rapid deployment of the PDR8000 for in-building coverage, special events or incidents can be connected to dispatch centers or other PDR8000s wherever they may be.

Applications:
- **Natural Disasters** – Hurricanes, Tornadoes, Earthquakes, Floods
- **Dignitary Protection** – Diplomatic Security, Heads of State, Military Leadership
- **Special Events** – Political Conventions, Sporting Events, Parades
- **In-Building Coverage** – Hotels, Arenas, Convention Centers
- **Interoperability** – Federal, State & Local Agencies

Figure 1 - PDR8000 - Portable Digital Repeater Open Case

2. Background

The PDR8000 provides a V.24 serial interface as an option which lets the users connect their PDR8000 to either an ASTRO® system infrastructure or another PDR8000 as illustrated in the figures below.
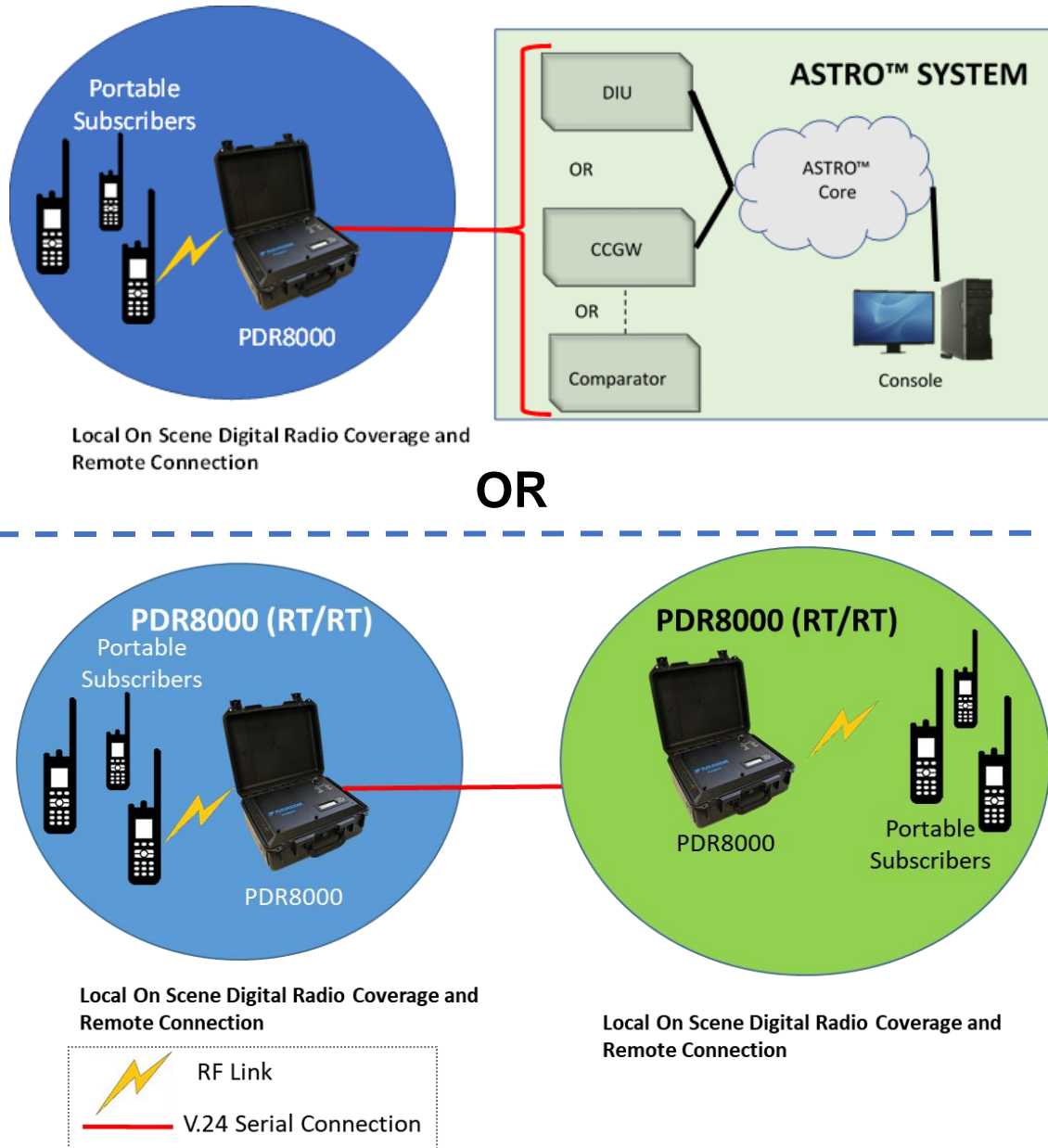
Figure 2 - PDR8000 Connectivity deployment V.24 to ASTRO® system or another PDR8000

3. PDR8000 Portable Digital Repeater Remote Operations

With each remote connectivity deployment option, agencies can make use of all available Voice, Data, Supplementary Services and Station Control features on the PDR8000 remotely.

Examples of these features include:

- **Voice Calls (Encrypted and Clear)**
- **Data**
    - Over The Air Re-keying (OTAR)
- **Supplementary Services**
    - Call Alert
    - Emergency Alarm
    - PTT ID
    - Radio Check
    - Radio Enable/Disable
    - Radio Message
    - Radio Status
    - Remote Monitor
    - Status Request
    - Voice Selective Call
- **Station Control**
    - Channel Select
    - Monitor
    - Repeat Control

4. PDR8000 Connectivity Deployment Options

Realizing the customers' needs, Futurecom Systems Group, ULC has put together a series of use cases providing remote connectivity by extending the wireline interface over a variety of wired and wireless networks as follows:

1. V.24 ⟷ IP Modems (LTE Network)

2. V.24 ⟷ IP Modems (Wired LAN/WAN)

3. V.24 ⟷ Serial Modems (PSTN, Leased Line)

The following sections describe each connectivity deployment's architecture, use cases and the equipment which were used to test each configuration.

Note: All connectivity equipment manufacturers and models and mentioned in this document are off the shelf products acquired by Futurecom Systems Group, ULC for the sole purpose of testing functions on the PDR8000. Futurecom Systems Group, ULC does not sell any of the connectivity modems or equipment manufactured by third party vendors. Futurecom Systems Group, ULC is not sponsored by these vendors and does not recommend, sponsor, or promote any of the equipment to the reader of this or any other documents where third-party equipment is mentioned. Futurecom Systems Group, ULC's product licensing agreement and warranty are not affected by this app note and are limited to the products manufactured by Futurecom Systems Group, ULC.
The products mentioned here have only been used to test the PDR8000 functions and exclude any required security measures to protect the network and communication links. It is the end user's responsibility to identify their security threats and protect their network against those threats.

5. Connectivity Deployment 1 - V.24 ⬅➡ IP Modems Over LTE Network

With the continuing growth of commercial LTE network availability in all major urban areas, this connectivity deployment option lets the agencies connect their PDR8000 without being dependent on a wired network.

Use Cases:

- In field deployments for dignitary protection, incident management, special events, in-building coverage and interoperability between agencies
- Extending coverage beyond the range of a single PDR8000 over LTE network
- Provide means of fixed-end equipment to have access to Digital RF Channels remotely
- Use the PDR8000 as a portable Base Station / Repeater capable of supporting Voice, Data, Station Control and Supplementary Services

Architecture:

The following diagrams show connectivity architectures for extending the PDR8000 wireline interface over the LTE network.
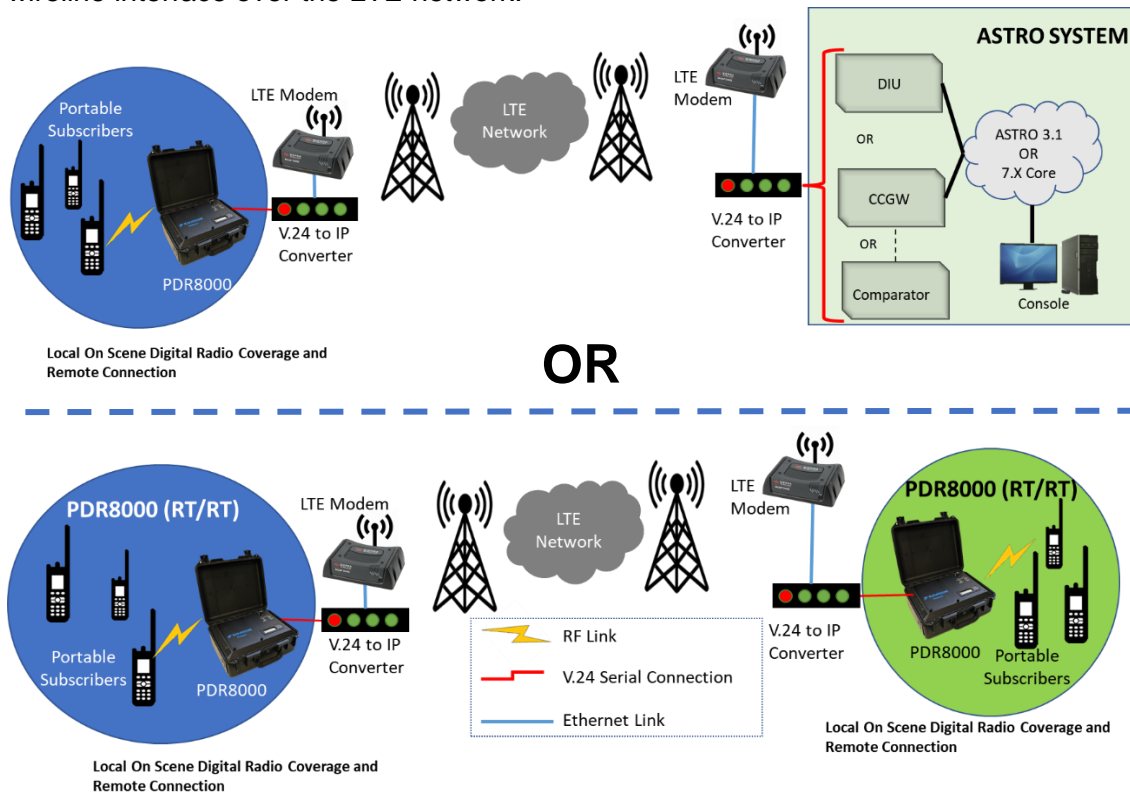
Figure 3 - PDR8000 Connectivity options over LTE network to ASTRO® or another PDR8000

All connectivity option networks allow the PDR8000 to either the ASTRO® system or another PD8000 for interoperability.

- PDR8000 V.24 port is connected to a V.24 to IP conversion modem

- Output of the V.24 to IP conversion modem is used as the input to the LTE modem
- The V.24 to IP modem and the LTE modems are mirrored on the other side
- On the other side, the LTE modem receives transmission over LTE network and sends the output via it's wired ethernet port
- The output from the LTE modem is used as input to V.24 to IP conversion modem to convert from IP to V.24 which can be interfaced to either the ASTRO® system or another PDR8000

Equipment Details:

Connectivity	Vendor Equipment*
V.24 ↔ IP Modem ↔ LTE↔IP Modem↔V.24	**V.24 to IP modems:** 1. Data Comm for Business (EST 9600) 2. Christine Wireless (RIC-Mz) **LTE modem:** Sierra Wireless GX450

*Purchasable from the vendors directly, not sold by Futurecom Systems Group, ULC

6. Connectivity Deployment 2 - V.24 ⟵⟶ IP Modem Over Wired LAN/WAN

Suitable for in-building coverage for offices, hotels, sports arena etc, the V.24 wireline interface can be extended over a wired IP LAN/WAN connection.

Use Cases:

- In field deployments for dignitary protection, special events, in-building coverage and interoperability between agencies
- Extending coverage beyond the range of a single PDR8000 over Wired LAN/WAN network
- Provide means of fixed-end equipment to have access to Digital RF Channels remotely
- Use PDR8000 as a portable Base Station / Repeater capable of supporting Voice, Data, Station Control and Supplementary Services

Architecture:

The following diagrams show connectivity architectures for extending the PDR8000 wireline interface over the wired IP network (LAN/WAN).
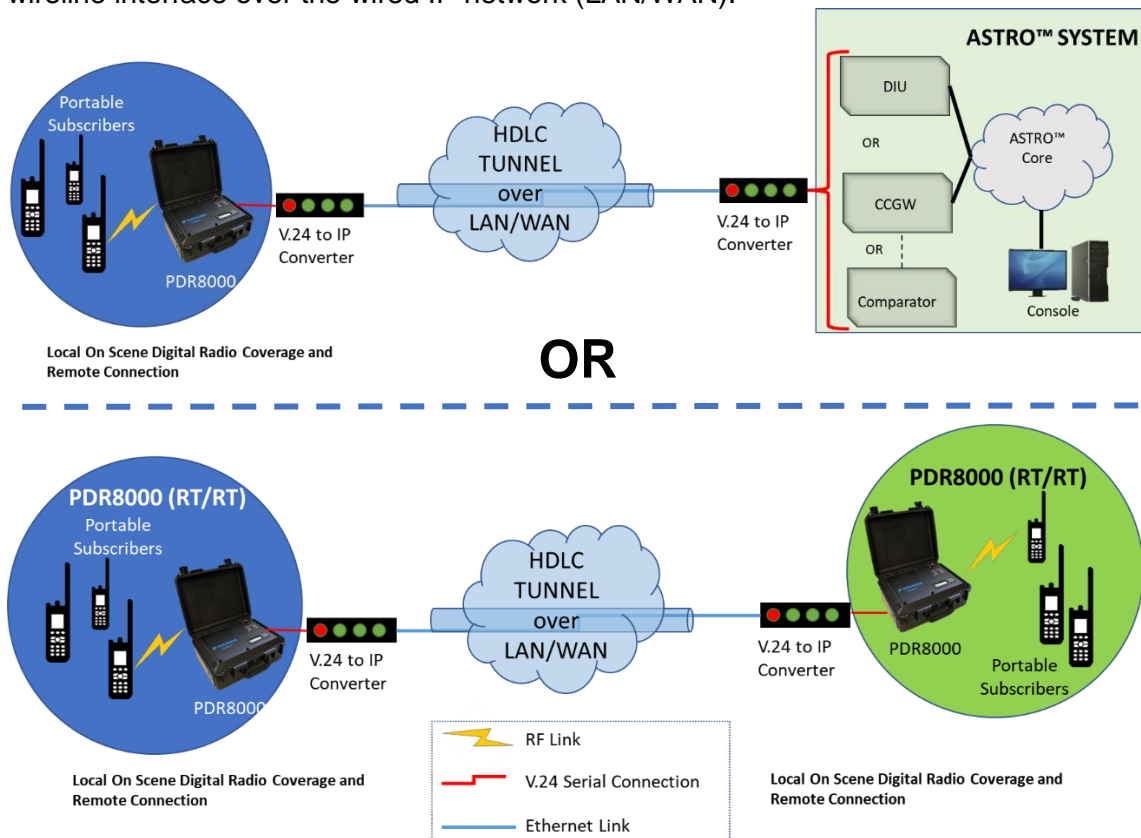

Figure 4 - PDR8000 Connectivity options over LAN/WAN to ASTRO® or another PDR8000

All connectivity option networks allow the PDR8000 to connect to either the ASTRO® system or another PDR8000 for interoperability.

- PDR8000 V.24 port is connected to a V.24 to IP converter modem
- Output of the V.24 to IP converter modem is directly connected to a LAN/WAN ethernet port
- The V.24 to IP converter modem is mirrored on the other side. Both sides communicate after establishing an HDLC tunnel over LAN/WAN network
- The other IP to V.24 converter modem covers voice and data traffic from IP to V.24 which can be interfaced to either the ASTRO® system or another PDR8000

Equipment Details:

Connectivity	Vendor Equipment[*]
V.24↔ IP Modem ↔LAN/WAN↔IP Modem↔V.24	**V.24 to IP modems:** 1. Data Comm for Business (EST 9600) 2. Christine Wireless (RIC-Mz)

*Purchasable from the vendors directly, not sold by Futurecom Systems Group, ULC

7. Connectivity Deployment 3 - V.24 Serial Modems Over Telephone Network

One of the simplest setup allowing users to rapidly deploy connectivity with the PDR8000 over any telephone network. Suitable for in building coverage for offices, hotels, sports arena etc, the V.24 wireline interface can be extended over any available telephone network such as the Packet Switch Telephone Network (PSTN) or Leased Line.

Use Cases:

- In field deployments for dignitary protection, special events, in-building coverage and interoperability between agencies
- Extending coverage beyond the range of a single PDR8000 over telephone networks
- Provide means of fixed-end equipment to have access to Digital RF Channels remotely
- Use PDR8000 as a portable Base Station / Repeater capable of supporting Voice, Data, Station Control and Supplementary Services

Architecture:

The following diagrams show connectivity architectures for extending the PDR8000 wireline interface over the PSTN of Leased / Fixed line telephone network.
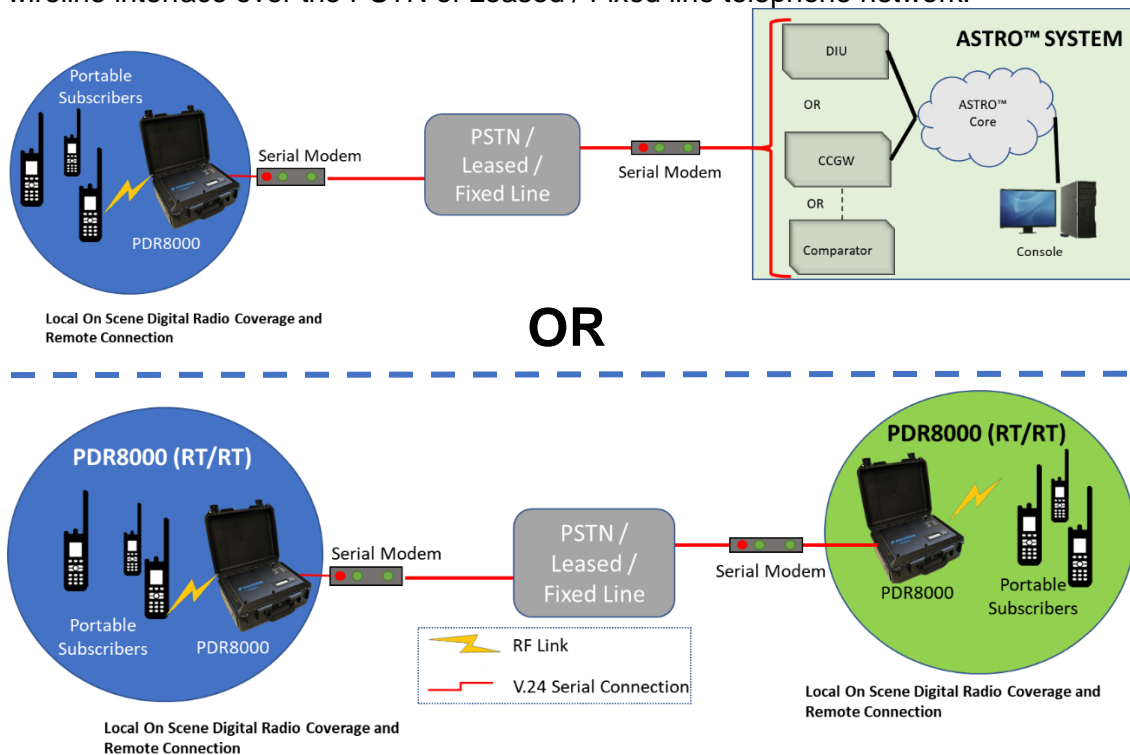

Figure 5 - PDR8000 Connectivity options over telephone link to ASTRO® or another PDR8000

All connectivity option networks allow the PDR8000 to either the ASTRO® system or another PDR8000 for interoperability.
- PDR8000 V.24 port

- is connected to a serial modem
- The serial modems are connected to a PSTN or Leased/Fixed Line telephone connection
- The serial modem is mirrored on the other side which outputs V.24 to either an ASTRO® system or another PDR8000

Equipment Details:

Connectivity	Vendor Equipment*
V.24↔Serial Modem↔PSTN/Leased/Fixed Line↔Serial Modem↔V.24	**Serial Modems:** 1. Raymar-Telenetics V.3600 SA Modems 2. Paradyne 325

*Purchasable from the vendors directly, not sold by Futurecom Systems Group, ULC

8. Document Revisions

Rev	Date	By	Notes & References
1.0	2019-03-04	SH	First release
2.0	2019-08-26	SH	Update to serial modem model information
2.1	2022-12-07	KS	**Logo Updated**