PUNQTUM

BY RIEDEL

SYSTEM SETUP GUIDE

Network Setup Recommendations

Q-Series Network Based Intercom System

1 Preface

Welcome to the punQtum digital intercom family!
This document provides detailed information about the punQtum Q-Series digital partyline system.

NOTICE
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1.1 Information

Symbols

The following tables are used to indicate hazards and provide cautionary information in relation to the handling and use of the equipment.

	This text indicates a situation that needs your close attention. It may also be used to alert against unsafe practices.

	This text is for general information. It indicates the activity for ease of work or for better understanding.

Service

- All service must be provided ONLY by qualified service personnel.
- There are no user-serviceable parts inside the devices.
- Do not plug in, turn on or attempt to operate an obviously damaged device.
- Never attempt to modify the equipment components for any reason.

	All adjustments have been done at the factory before the shipment of the devices. No maintenance is required and no user-serviceable parts are inside the unit.

Environment

- Never expose the device to high concentrations of dust or humidity.
- Never expose the device to any liquids.
- If the device has been exposed to a cold environment and transferred to a warm environment, condensation may form inside the housing. Wait at least 2 hours before applying any power to the device.

Disposal

	This symbol, found on your product or on its packaging, indicates that this product should not be treated as household waste when you wish to dispose of it. Instead, it should be handed over to an authorized collection point for the recycling of electrical and electronic equipment. By ensuring this product is disposed of correctly, you will help prevent potential negative consequences to the environment and human health, which could otherwise be caused by inappropriate disposal of this product. The recycling of materials will help to conserve natural resources. For more detailed information about the recycling of this product please contact the local authority responsible.

2 About punQtum Q-Series Digital Partyline Intercom System

punQtum Q-Series digital partyline intercom system is a digital, easy to use, full-duplex communications solution for theater and broadcast applications as well as for all kinds of cultural events like concerts, etc.
It is an all-new, network-based partyline intercom system which combines all standard partyline system features including wireless access and more with the advantages of modern IP networks. punQtum Q-Series works on standard network infrastructure and is easy to install and set up. The system works “out of the box” with a factory default configuration but can be quickly configured by user-friendly software to meet individual needs.
The system is completely decentralized. There is no master station or any other central point of intelligence in the whole system. All processing is handled locally in each device except for the punQtum wireless Apps which require a punQtum Q210 PW Speaker Station to serve as a bridge to the Q-Series digital partyline intercom system. The capacity of one partyline intercom system is set to a maximum of 32 channels, 4 program inputs, up to 4 public announce outputs and 32 control outputs. Each punQtum Q210 PW Speaker Station serves up to 4 punQtum Wireless App connections.

punQtum Q-Series digital partyline systems are based on Roles and I/O settings to ease the use and administration of partyline intercom systems.
A Role is a template for the channel configuration of a device. This allows channel settings and alternate functions to be predefined for different Roles needed to run a live show. As an example, think of the stage manager, sound, light, wardrobe and security personnel having different communication channels available to deliver a perfect job.
An I/O setting is a template for the settings of the equipment connected to a device. This, for example, allows I/O settings to be available for different Headsets being used at a venue to cover for different environmental situations.
Each device can be configured to any Role and I/O setting available.

Multiple punQtum partyline intercom systems can share the same network infrastructure. This allows for the creation of production islands within a campus using the same IT network infrastructure. The number of devices (Beltpacks/Speaker Stations and Wireless Apps) is theoretically infinite but limited by the network capacity. Beltpacks are powered by PoE, either from a PoE switch or from a Speaker Station. They can be daisy-chained to reduce wiring efforts on site.

Beltpacks and Wireless Apps support simultaneous use of 2 channels with separate TALK and CALL buttons as well as one rotary encoder for each channel. An alternate page button allows the user to quickly reach alternate functions such as public announce, Talk To All, Talk To Many, to control general purpose outputs and access system functions like Mic Kill asf. The Beltpack is designed with a combination of premium materials, including high-impact plastics and rubber to make it both tough and comfortable to use in any situation.

punQtum Q-Series Beltpacks, Wireless Apps and Speaker Stations allow users to replay missed or not understood messages. Program input signals can be fed into the system using an analog audio input at any Speaker Station.

Sunlight readable, dimmable RGB color displays used for Beltpacks and Speaker Stations make for excellent readability of the intuitive user interface.

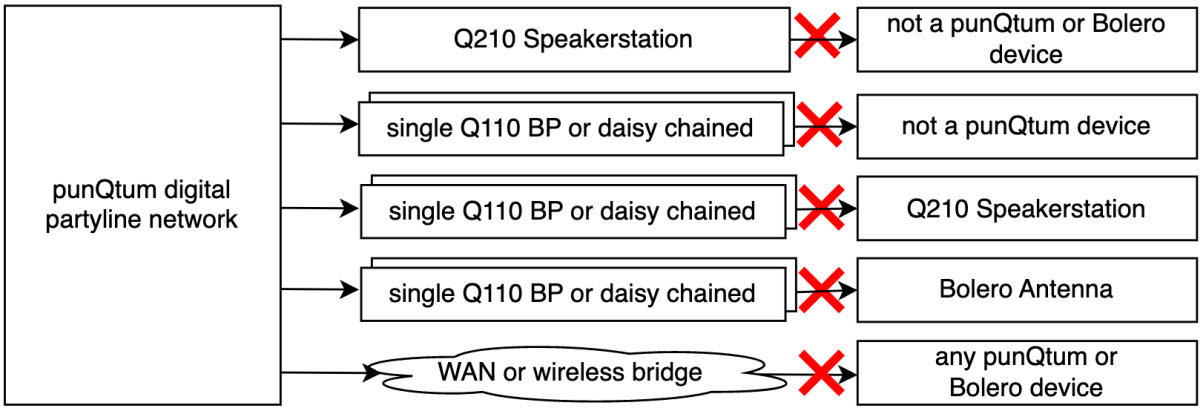
3 Network Setup Recommendations

Running punQtum Q-Series digital partyline intercom systems in a dedicated, standard IP network is recommended.
punQtum Q-Series digital partyline intercom systems operate in unmanaged LAN or VLAN environments.
If operated in a dedicated LAN or VLAN, no QoS is needed. punQtum Q-Series digital partyline intercom systems rely on UDP and multicast, use PTPv2 as clock source and offer Plug & play (self-discovery).
WAN, wireless bridge or Internet connection of devices are not supported.

3.1 Network Topologies

Star topologies using Ethernet switches are preferred to daisy-chained networks. Use daisy-chaining of devices only where needed.

3.1.1 Unsupported topologies



As a best practice recommendation, the PC running Q-Tool shall not be connected to the output port of a Q110 Beltpack.

3.2 Network cabling

CAT5 or better cables are required.
Maximum supported length between devices is 100 meters according to TIA/EIA 568-5-A.
For PoE daisy chained setups the minimal wire gage needs to be AWG26 for PoE or PoE+ outputs. For PoE++ outputs use AWG22 wire gage cables for proper operation of the daisy chained devices. See also 3.3.2 Beltpack daisy-chaining

3.2.1 Q210 P and Q210 PW Network Switch Connections

The Q210 P and Q210 PW Speaker Station provides 4 unmanaged network switch ports to connect Q110 Beltpacks and other intercom system equipment.
The network ports labeled PoE+ provide power to 4 daisy chained Q110 Beltpacks each. No additional network equipment is needed to run punQtum Q-Series digital partyline intercom systems. However, punQtum Q-Series digital partyline intercom systems can easily be integrated into existing network infrastructure using the non PoE+ ports.

	Do not connect outputs of PoE capable switches to the PoE+ ports of the Speaker Station as they might show non-compliant PoE standard behavior and provide power to the Speaker Station as well.

3.3 Powering devices

3.3.1 Speaker Stations

⚠	Only use the provided AC/DC power adapter for powering the Q210 P and Q210 PW Speaker Station. Always leave the DC plug connected to the Speaker Station and switch power on the AC side only. Do not connect outputs of PoE capable switches to the PoE+ ports of the Speaker Station as they might show non PoE standard behavior and provide power to the Speaker Station as well.

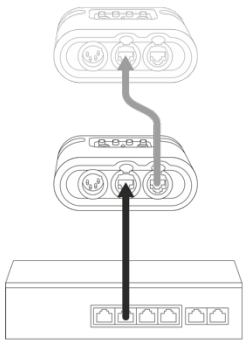
3.3.2 Beltpack daisy-chaining

⚠	Although punQtum Q110 Beltpacks can be intelligently and reliably daisy-chained, please note that the number of daisy-chained Q110 units is limited by the available PoE power budget, Ethernet cable length and quality. Do not connect devices other than Q110 Beltpacks to Q110 output ports.

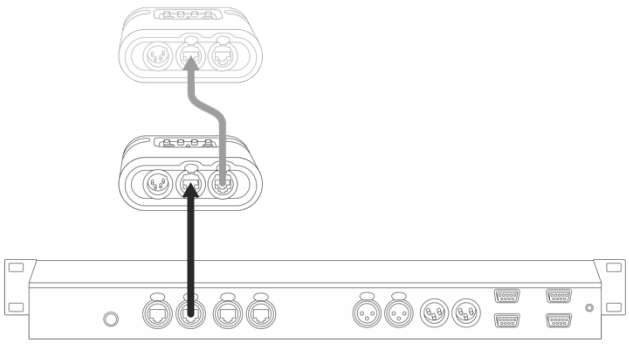
The number of daisy chained Q110 devices are set to a maximum of:

- PoE port complies with PoE standard 802.3 at: **2 Beltpacks**
  (100m cable length between each device, cable AWG26)
- PoE port complies with PoE+ standard 802.3 at: **4 Beltpacks**
  (100m cable length between each device, cable AWG26)
- PoE port complies with PoE++ standard 802.3 bt: **8 Beltpacks**
  (100m cable length between each device, cable AWG22)

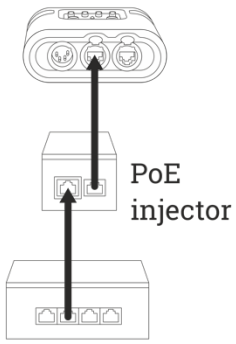
One or more Q110 powered by a PoE switch:



One or more Q110 powered by a punQtum Q210P or PW Speakerstation:



One or more Q110 powered by a PoE injector:



3.4 Unmanaged Network operation

punQtum Q-Series digital partyline intercom systems operate in dedicated, unmanaged standard IP LAN or VLAN environments.
If operated in a dedicated LAN or VLAN, no QoS is needed. punQtum Q-Series digital partyline intercom systems rely on UDP and multicast, use PTPv2 as clock source and offer Plug & play (self-discovery).

3.5 Managed Network operation

Make sure your managed switch infrastructure is properly set up to support Bonjour, UPnP, UDP and multicast transport, PTPv2 time synchronization, IGMPv2 and DiffServe (DSCP/QoS).
Using AES67/Ravenna profiles as a starting point is usually a good choice.

3.5.1 Multicast Streams

If you are using punQtum Q-Series digital partyline systems in networks together with other audio network streaming technologies such as Ravenna, DANTE™ or other multicast-based streaming technologies, you need to make sure that your network infrastructure supports IGMP (Internet Group Management Protocol) and that IGMP is correctly set up and configured.
Do not forget to reboot the whole system after changing IGMP switch settings.

	If you use a single switch only, it is irrelevant if the switch has IGMP snooping (aka multicast filtering) enabled or not. As soon as you have two switches, and one or more switches happen to have IGMP snooping enabled, it is necessary to configure one and only one IGMP querier in the network (usually, you select one switch). Without an IGMP querier, the multicast traffic will stop after a while due to IGMP timeouts. punQtum Q-Series digital partyline system supports IGMP V2.

3.5.2 PTPv2 time synchronization

punQtum devices rely on PTPv2 to sync audio content. Make sure the switches in use are set up to support PTPv2.

3.5.3 QoS - quality of service

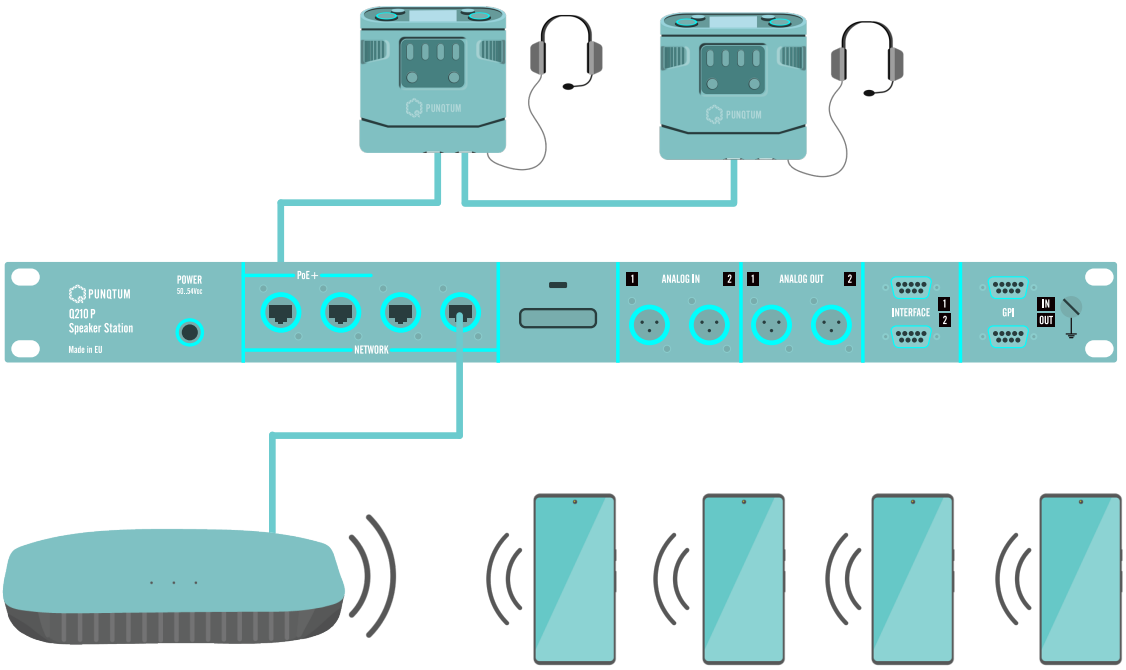
Enable QoS based on DSCP priorities (use standard/default priorities).

3.5.4 VXLAN

As VXLAN technology does not support PTP and QoS, stable operation of punQtum digital partyline systems is not possible.

3.6 Wi-Fi network for punQtum Wireless App integration

If your system includes Q210 PW Speakerstations providing connections to mobile devices running the punQtum Wireless App, you need to add dedicated Wi-Fi network infrastructure to your cable-based LAN.
To be able to operate mobile devices, your network needs to provide DHCP functionality for all connected devices. Use a Wi-Fi router or DHCP capable switch to do so.



3.6.1 Wi-Fi Network requirements and recommendations

- Wi-Fi 5 (802.11ac) or higher
- A single DHCP service for the wired and wireless network segments is required.
- Good password protection for the Wi-Fi network is recommended.
- Use the same network name (SSID) for 2.4 and 5 GHz bands for best results as modern phones always choose the best band and channel automatically.
- For mesh type Wi-Fi setups, using devices with 3 radio transmission bands is recommended.
- Providing internet access on the intercom network is not recommended.

3.6.2 Recommended Wi-Fi infrastructure

Tested devices with positive results:

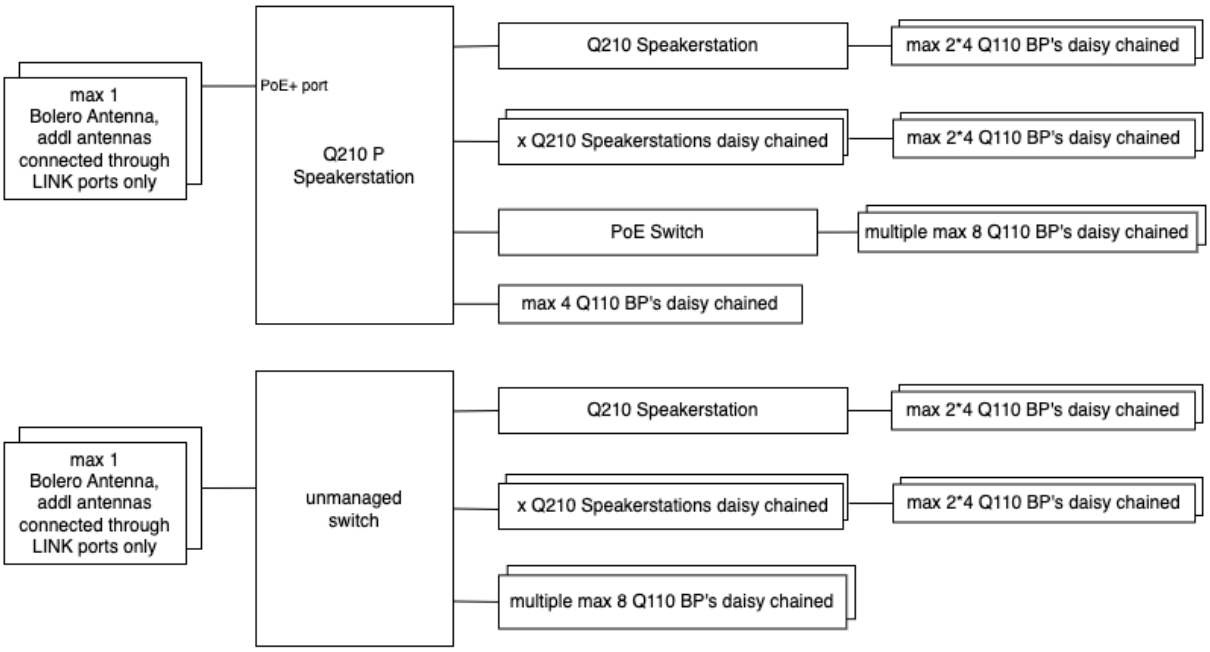
- Asus RT-AX53U and ZenWi-FiXT8
- Linksys AC1750 and MR7350
- MikroTik hAP ax and cAP ax
- NetGear RAX10, and WAX610
- Opal GL-SFT1200
- TP-Link TL-Archer C6 AC1200, Archer AX10, TL-WR841N
- Amazon Eero 6

3.7 Bolero connect network setup recommendations

Operate Bolero and a punQtum Q-Series digital partyline intercom system in the same LAN or VLAN without any other devices present except for the PC running the configuration SW. It is also possible to operate Bolero together with a punQtum intercom system in the same physical network if the Bolero part is set to a fixed IP range and the punQtum system runs on auto IP. Star topologies are preferred. Use daisy chaining of devices only where needed.

3.7.1 Unmanaged Network Operation

Operating a single Bolero Antenna together with a punQtum Q-Series digital partyline intercom system is supported for unmanaged networks.
The Bolero Antenna connected can be powered from a PoE+ port of a Speakerstation.
Additional Bolero Antennas must be connected through LINK ports only: use Bolero-Standalone-LINK mode.



3.7.2 Managed Network Operation

Make sure IGMP snooping is enabled and switches are PTP capable and use QoS based on DSCP priorities (use standard/default priorities).
Have all Bolero equipment connected to the managed part of your Network setup as punQtum devices use unmanaged switches internally.