



LQ™ Series User Guide



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Document Reference

Clear-Com LQ Series User Guide

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Important Safety instructions

Read these instructions.

Keep these instructions.

Heed all warnings.

Follow all instructions.

Do **not** use this apparatus near water.

Clean only with dry cloth.

Install in accordance with the manufacturer's instructions.

Do **not** install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.

Do **not** defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades and a third grounding prong. The wide blade or the third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.

Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.

Only use attachments/accessories specified by the manufacturer.

Unplug this apparatus during lightning storms or when unused for long periods of time.

Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way such as; power-cord supply or plug is damaged, liquid has been spilled, objects have fallen into the apparatus, the apparatus has been exposed to heavy rain, the apparatus does not operate normally.

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1 Overview

LQ™ allows you to connect 4-wire and partyline audio with call signaling over IP networks quickly and easily.

The product line provides a unique combination of low latency with exceptional audio quality and an intuitive, easy to use design.

The LQ product is available in 5 models; the LQ-2W2 and LQ-4W2 devices are small, robust 2-port throw-down boxes for fast and convenient installation. These devices operate on Power over Ethernet (PoE) for situations where a power supply is not easily available. The LQ-R devices (LQ-R4W8, LQ-R2W4-4W4, LQR-2W4) are single rack units providing 4 or 8 ports in a combination of 4-wire and 2-wire options for more extensive installations.

The LQ product line offers:

- LAN, WAN and Internet connectivity
- Up to 48 ports of audio can be routed through the system using customizable Virtual Partylines
- Up to six units can be linked together
- 5 different LQ models.
- Web based Core Configuration Manager (CCM)
- Per-port adjustment of network/audio quality settings
- Low latency OPUS CODEC
- LQ units: External power supply or Power over Ethernet (PoE)
- LQ-R units: Dual redundant external power supply

- 2-wire
 - 2-wire line termination,
 - Auto nulling,
 - Clear-Com/RTS modes with both RMK/Call signaling pass-through

- 4-wire
 - 4-wire To Panel/To Matrix interface switch
 - Panel data can be transmitted, allowing panels to connect over LAN, WAN and Internet.
 - Call signaling

1.1 LQ and LQ-R models

	<p>LQ-2W2 Throw-down unit Two 2-wire partyline connectors (XLR F)</p>
	<p>LQ-4W2 Throw-down unit Two 4-wire connectors (RJ45, etherCON)</p>
 <p>LQ-R2W4 1 RU unit Four 2-wire ports, each with a male and female connector. (XLR) Dual redundant power supply connectors</p>	
 <p>LQ-R4W8 1 RU unit Eight 4-wire connectors, (RJ45, etherCON) Dual redundant power supply connectors</p>	
 <p>LQ-R2W4-4W4 1 RU unit Four 2-wire connectors (XLR F) Four 4-wire connectors (RJ45, etherCON) Dual redundant power supply connectors</p>	

1.2 Basic example applications

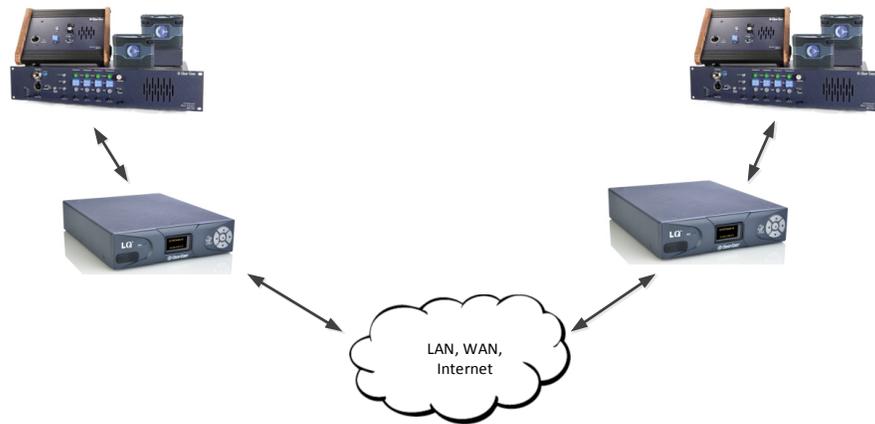


Figure 1-1 Partyline to partyline (2-wire connection)

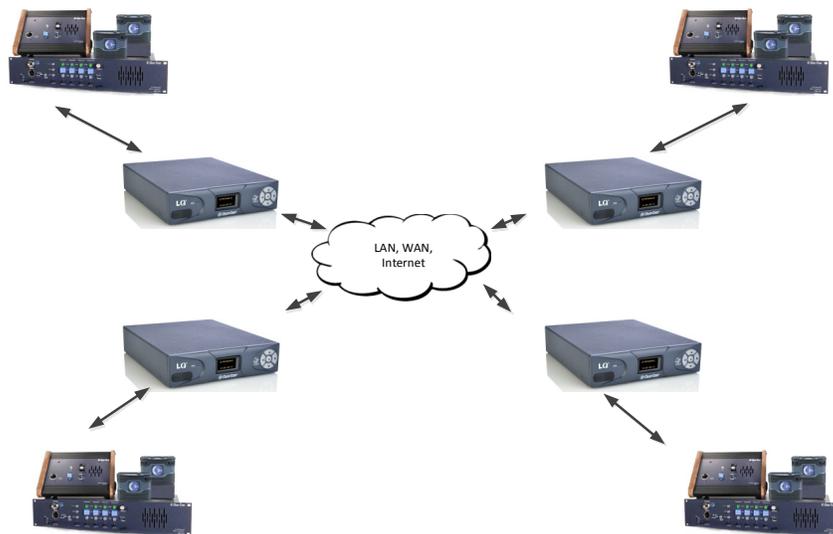


Figure 1-2 Partyline to partyline (2-wire connection). 8 ports, 2 per LQ unit

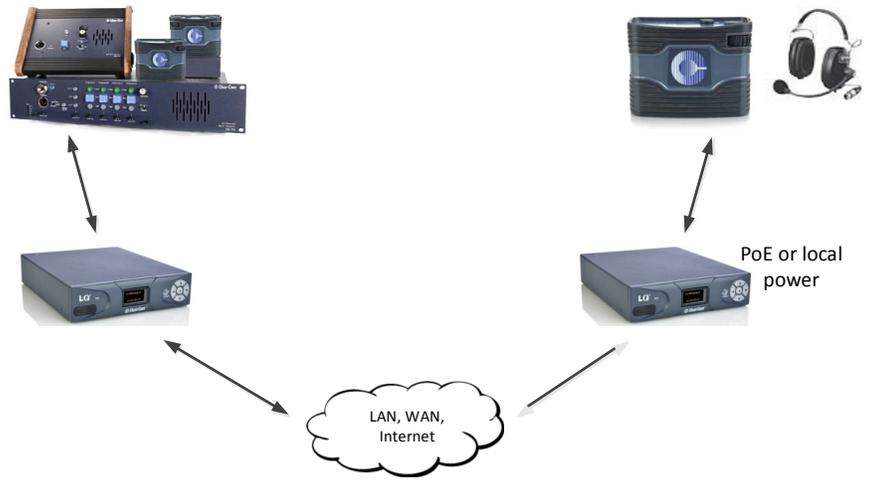


Figure 1-3 Partyline to beltpack

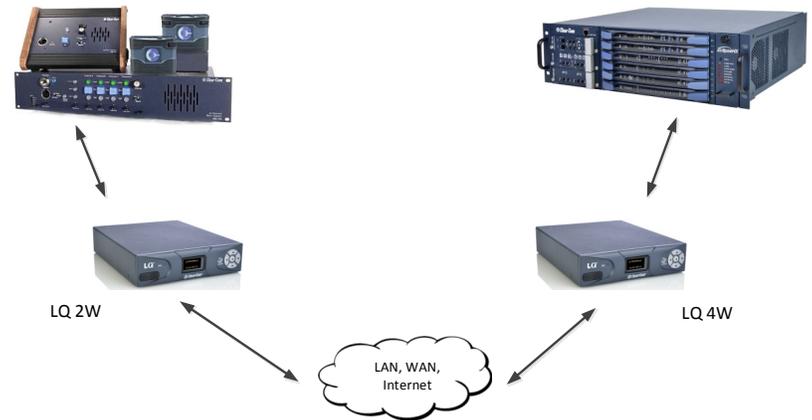


Figure 1-4 Partyline to matrix (2-wire to 4-wire)

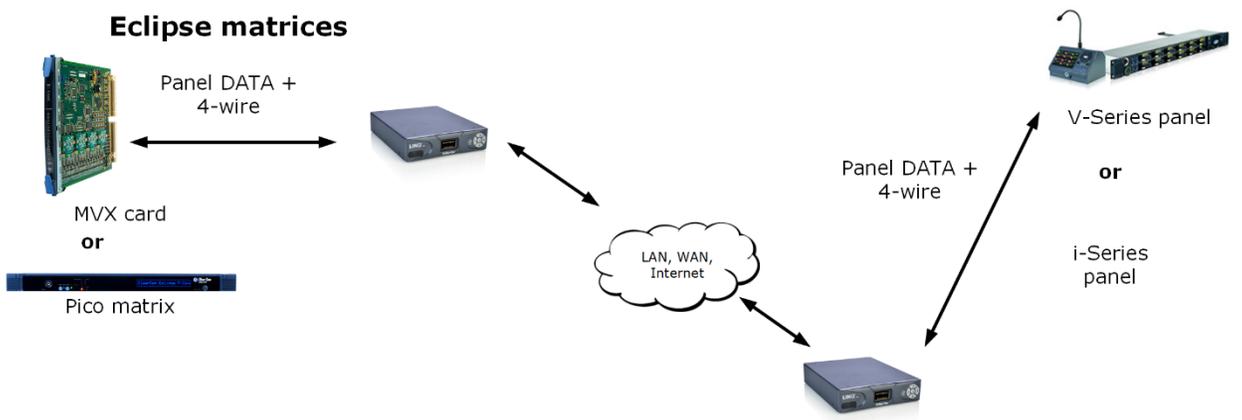
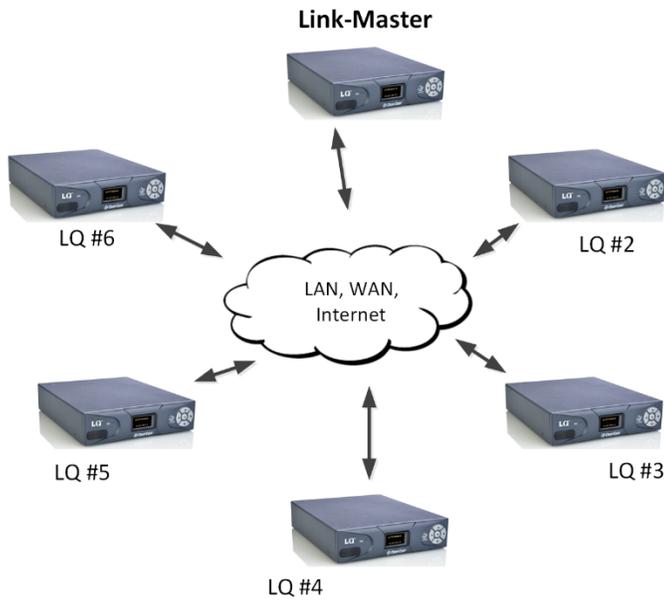


Figure 1-5 Panel data over 4-wire connection. Replaces VoICE 2.0 product.

Note: Panel data is passed between a pair of LQ devices, providing a 4-wire direct connection between two ports.

1.3 Link-Group



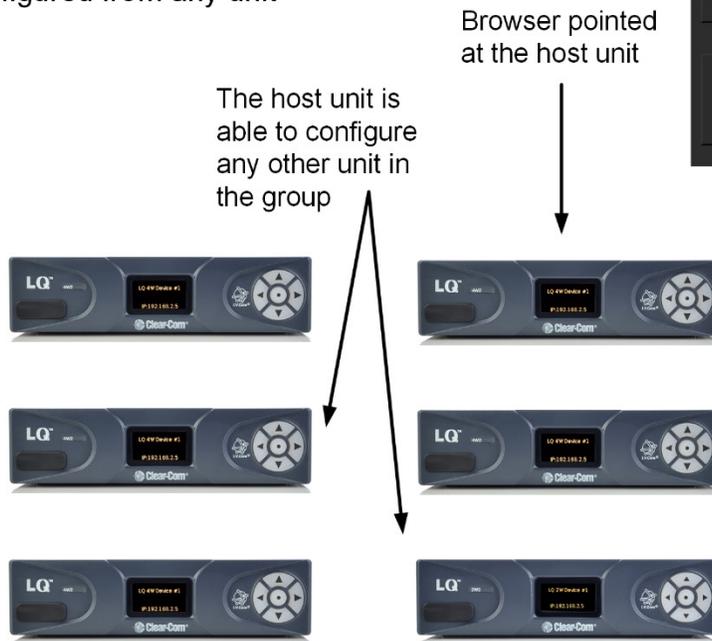
- 1 box is set to Link-Master
- Each LQ joins the group through the Link-Master
- Up to 6 LQs in a Link-Group

Channels

There are six channels within each Link-Group (channels can be added or taken away as required). Any port on any LQ can be assigned to any of the channels. To assign ports to channels navigate to **Assignments** in the Core Configuration Manager.

Figure 1-6 A Link-Group

Once connected, devices in a Link-Group can be configured from any unit



Browser pointed at the host unit

The host unit is able to configure any other unit in the group

Click on any unit to access configuration and control options

Figure 1-7 Configuring a Link-Group from any device

Note: The Core Configuration Manager (the Web-based management interface) for any unit can be reached either directly, by entering the IP address (displayed on the front of the unit) into a browser address field or via the **Overview** page of any unit in the Link-Group.

1.4 Example advanced application

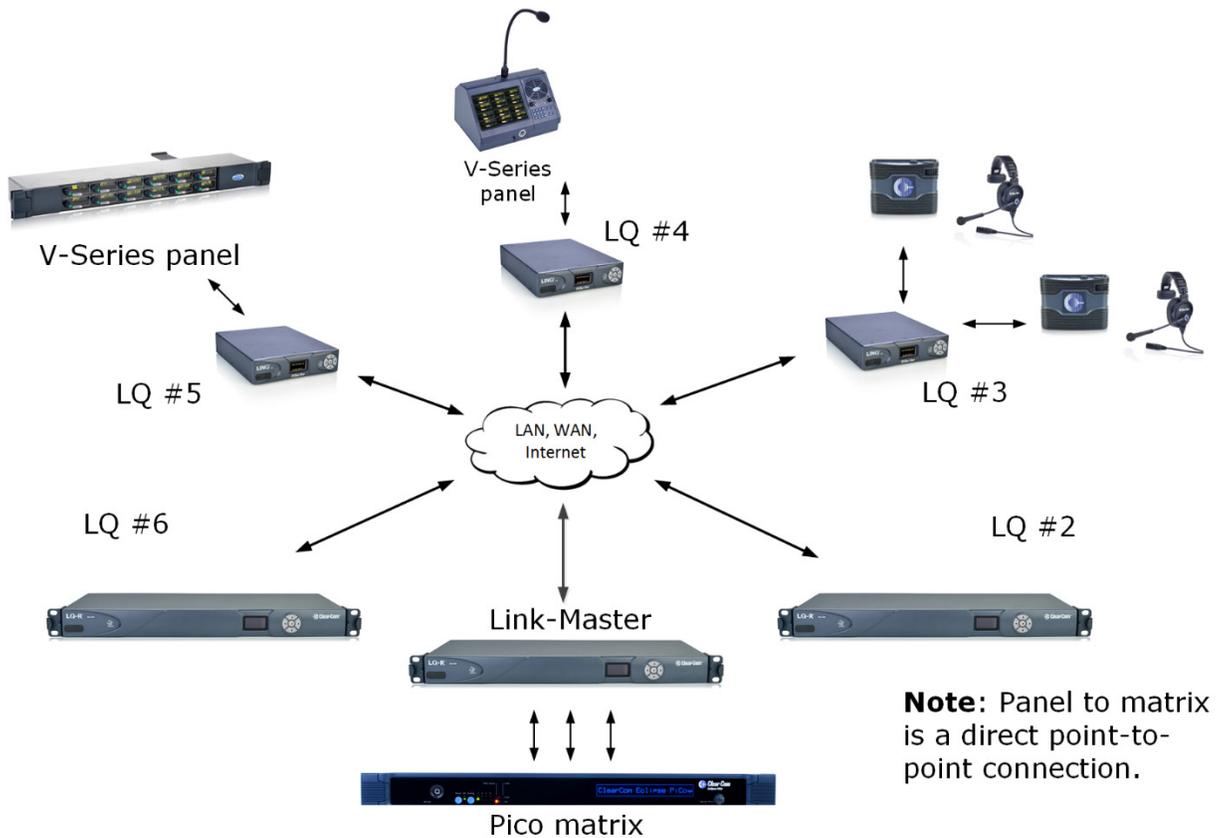
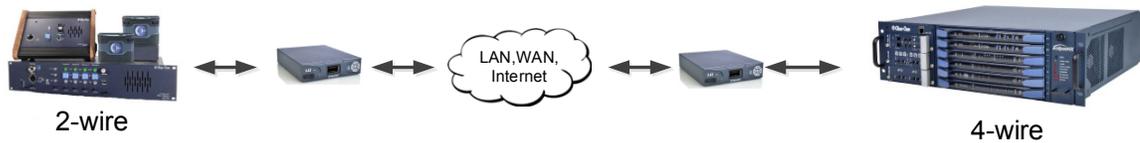


Figure 1-8 Example application, partyline and 4-wire direct (panel data)

See **11.4 Example audio assignment via a Pico matrix** for example audio routes for this setup.

2 Basic setup (LAN)



2.1 Setting up your LQ environment

Prepare your environment by gathering the following equipment:

- LQ units (LQ #1 and LQ #2)
 - (2) provided power supply units (PSUs)
 - (2) Straight-through Ethernet cables
 - (1) Network connection with dynamic host control protocol (DHCP) server present
 - (2) 2-wire or 4-wire devices to provide an audio connection to each LQ
- 1) Using the Ethernet cable, connect LQ #1 to LQ #2 using either using either LAN port on the rear of the unit.
 - 2) Using another Ethernet cable, connect LQ #1 to your DHCP enabled network.



Figure 2-1 LQ device front panel display (4-Wire)

Note: The IP address will be allocated by DHCP (default mode). In the event that the network does not serve DHCP or there is no network connection, the IP address will revert to a link-local address. See **8 Link-local environments** for more information.

- 3) Connect the provided PSU to each LQ device. Each device will display an IP address on the front panel display.
- 4) Connect audio equipment to **Port A** of each LQ device.

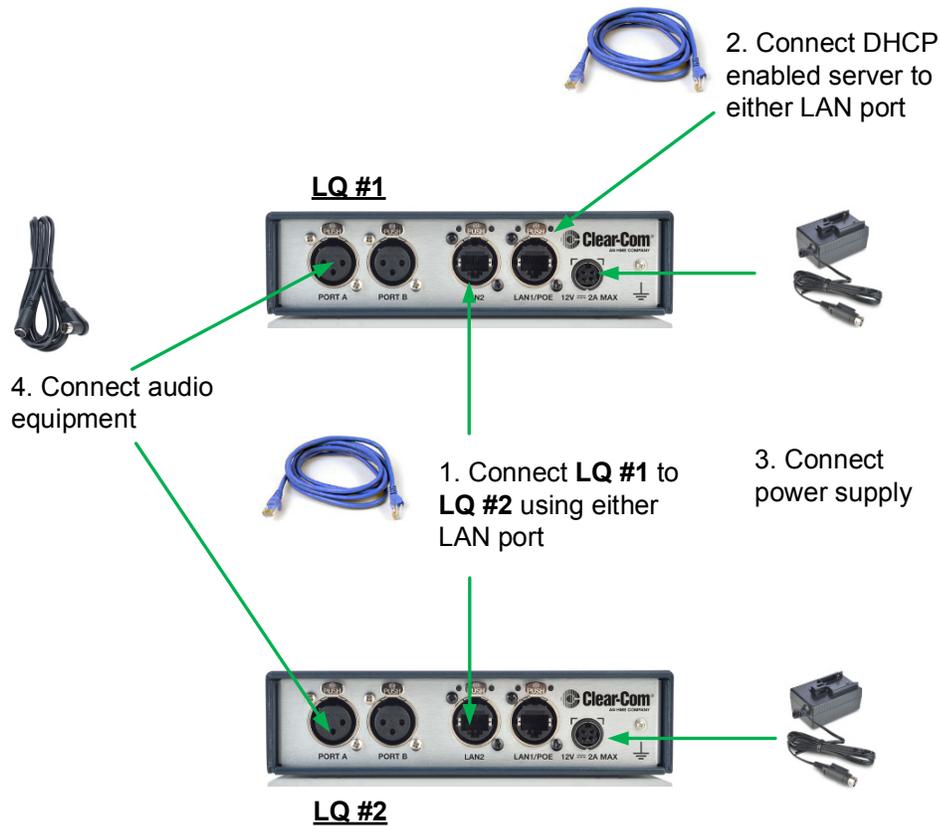


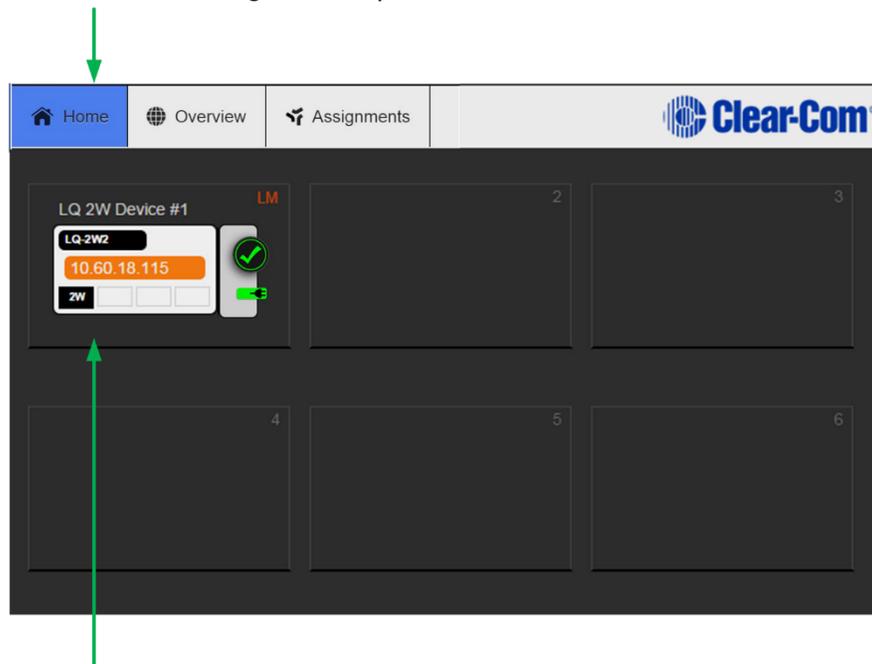
Figure 2-2 Basic setup

2.2 Accessing the Core Configuration Manager (CCM)

From a computer, open a Web browser. Enter the IP Address as displayed on the **LQ #2** device in the address field of the Web browser (Chrome, Safari, Firefox, IE, Opera). This takes you to the Core Configuration Manager.

Note: Default username and password for the CCM: **admin, admin.**

Navigation bar. Click **Home** to access current device configuration options



Current (host) device

Figure 2-3 Core Configuration Manager

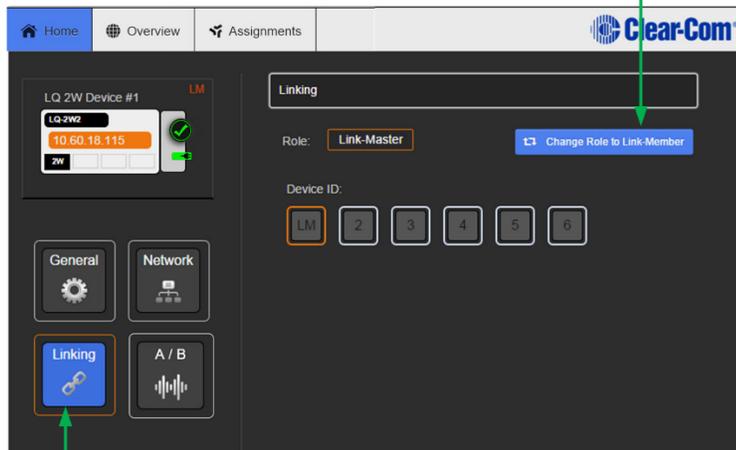
2.3 Create a Link-Group

Before linking units together, one LQ device must first be designated as the Link-Master. This is accomplished by setting that device's role to **Link-Master**. Every other LQ device within the Link-Group will then be set into a **Link-Member** role which allows the linking of those units directly to the Link-Master.

In this example, LQ #1 will be left as Link-Master (default configuration) and LQ #2 will be linked to it.

- 1) Navigate to **Home > Linking** on the CCM of LQ #2.
- 2) Click **Change Role to Link-Member**.

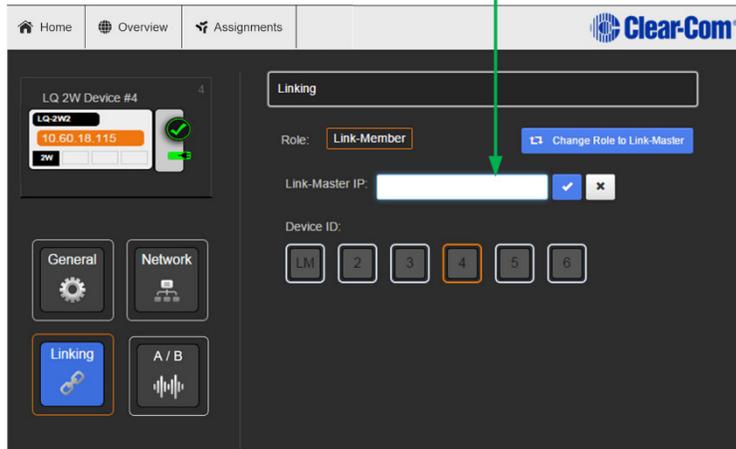
Change Role to Link-Member



Navigate to **Linking**

- 3) Within the **Master IP** address field, enter the IP address as displayed on the **LQ #1** device. Click on blue check mark or <ENTER> key to submit.

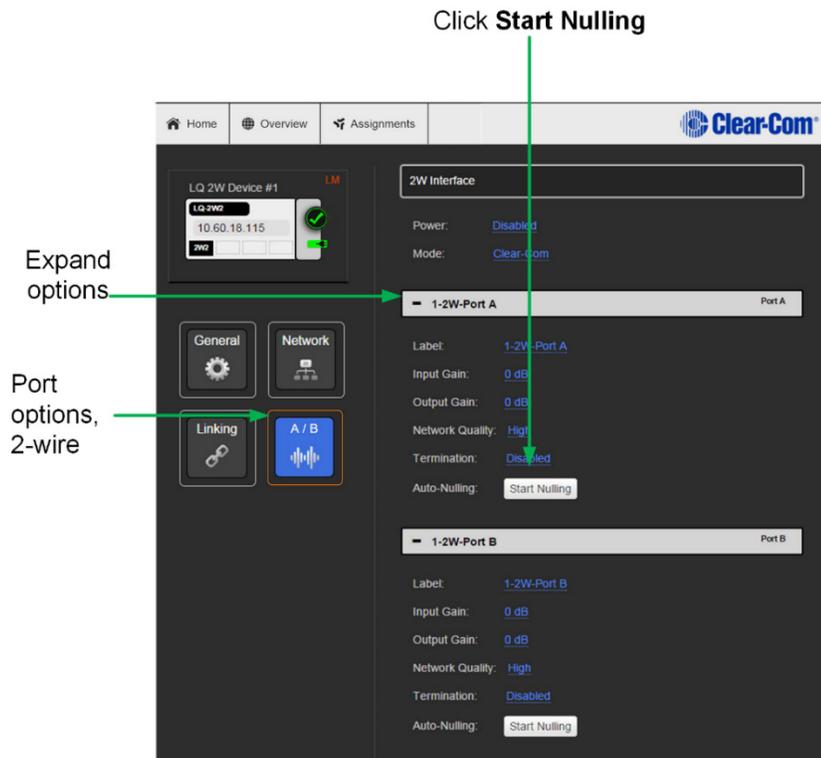
Enter IP address of LQ #1



- 4) Select an available device ID (highlighted in blue).



- 5) Click **Apply changes**.
LQ #1 and LQ #2 will now be linked.
- 6) Navigate to the **Overview** page (top navigation bar). Both LQ devices should be displayed on this page.
- 7) Before continuing, if either LQ device is a LQ-2W2 model, auto-null both ports. For each device: within the **General** page, navigate to **A/B**.
- 8) Expand port sections (A and B) and click on the **Auto-Nulling** button for each port.



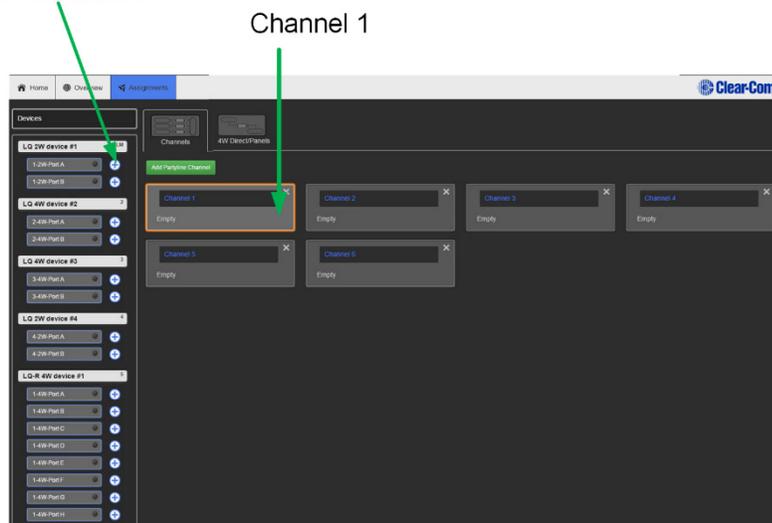
2.4 Assigning ports to a channel

- 1) Click on the **Assignments** button within the navigation bar.
- 2) Select the **Channel** tab.
- 3) Add **Port A** on each device to **Channel 1** by clicking on the **+** symbol to the right of each port.

You should now be able to pass audio and call/RMK signaling to/from Port A on each device.

Note: Channel 1 must be selected before audio can be assigned to it. This is shown by an orange highlight.

Click '+' to add port to Channel 1



2.4.1 Interface port settings

From the LQ Core Configuration Manager go to **Overview > A/B**. The LQ factory default settings are shown below.

2W	
Power	Disabled
Mode	Clear-Com
Input/Output gain	0dB
VOX mode	Disabled
Network quality	High
Termination	Disabled

4W	
Input/Output gain	0dB
Network quality	High
VOX mode	Disabled
Port function	To Matrix
Baud rate	19200 (Eclipse)

3 Powering your LQ™

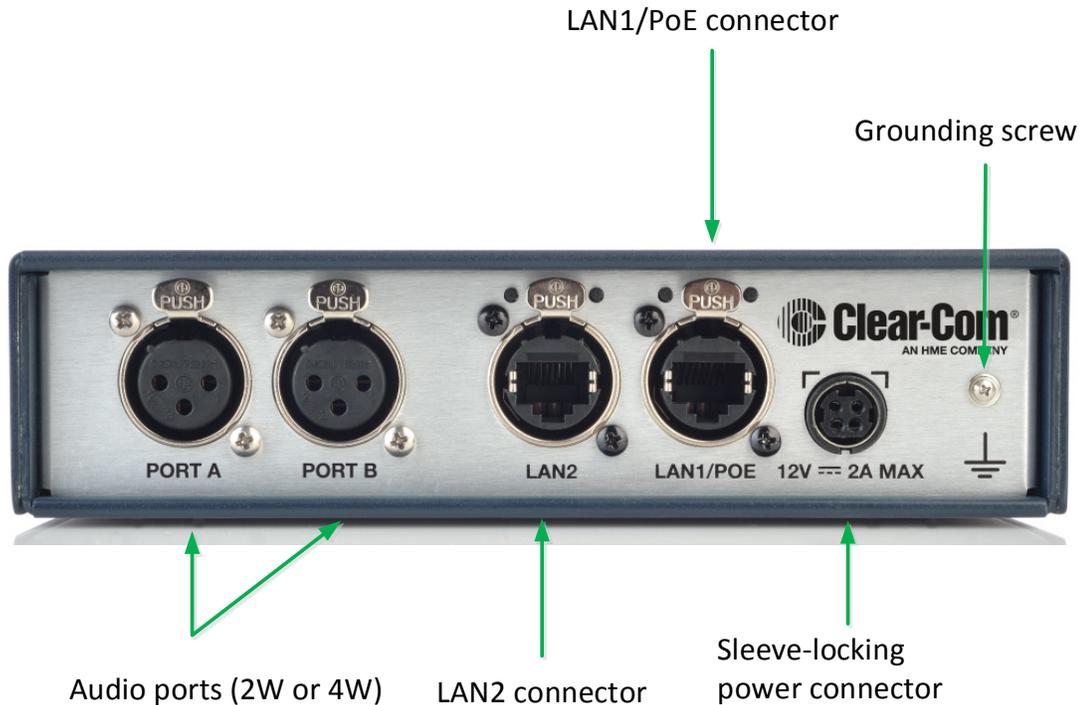


Figure 3-1 LQ unit rear panel (2-wire device)

3.1 Using the power supply unit (PSU)

- LQ units are supplied with a 24 watt sleeve-locking power connector.
- LQ-R 1RU units are supplied with two 60 watt sleeve-locking power connectors. Use either power connector, or both to guard against one power supply failing.

Note: When connecting the sleeve-locking power cable, be sure to push until the connector locks into the device.

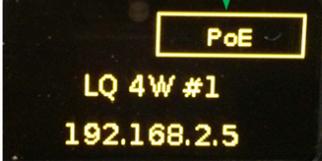
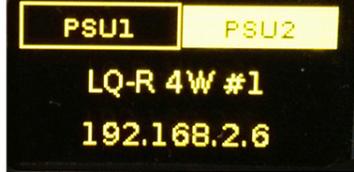
3.1.1 Understanding power display icons

You will be able to see the power status of your device is from:

- The front panel of the unit
- The device icon in the web based configuration tool (the CCM).

These indicators will show if the unit is using PoE or the PSU (LQ throw-down units), and which of the two power supplies (or both) are in use for the LQ-R units.

3.1.2 LQ Series front panel power display

<p>LQ throw-down units</p> <p>If the device is using the PSU, this will be lit up instead of the PoE indicator.</p>	<p>LQ device is using Power over Ethernet (PoE)</p> 
<p>LQ-R 1 RU units</p>	<p>PSU ON PSU OFF</p> 

3.1.3 Power 2-wire beltpacks from the partyline

2-wire partyline beltpacks take power from the partyline. The maximum numbers are shown in the table below.

LQ series unit	Power supply	mA supplied to the 2-wire interface (number of beltpacks powered by the partyline)
LQ	24 watts	150 mA (~5 beltpacks)
LQ	PoE	70 mA (~2 beltpack)
LQ-R	60 watts	250 mA (~10 beltpacks per pair of ports, max 20 per device)

3.2 Using power over Ethernet (PoE) with 2-port units

The 2-port units will receive power from the LAN1/PoE connector if required (this is not the case for the larger LQ-R units).

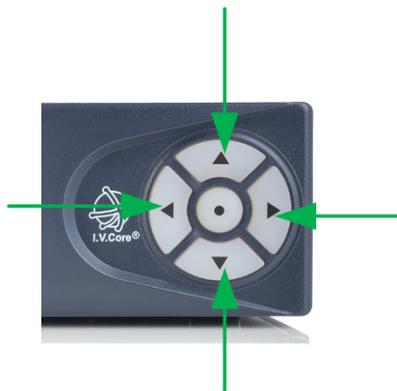
When using PoE the LQ-2W2 supplies approximately 70 mA of power to the 2-wire interface.

Note: If you are powering more than two LQ devices from one PoE switch, please consult the power output of the PoE switch, as you may reach the limits of its power capacity with more than two boxes.

If this happens, the device(s) will show a persistent flashing green light, and not move beyond the Clear-Com splash screen. This indicates that the device is continually booting and needs more power than the PoE switch or network is providing. In this case, consider using the supplied sleeve-locking power connector cable to power the device.

3.3 Re-boot system

The system will start its boot sequence immediately when power is applied. If you need to reboot for any reason, either cycle the power or press all four direction keys on the control panel on the front of the LQ unit at the same time.



Press all four direction keys at the same time to reboot.

4 Core Configuration Manager (CCM) walk-through

LQ units can be configured and controlled from the Web-based Core Configuration Manager. This includes all main functions:

- Linking units
- Network settings
- Port configuration
- Configuring of audio and signalization routing throughout the LQ-Group
- Adjusting network quality settings on a per port basis
- System monitoring and control
- Upgrading LQ units.

To access the Core Configuration Manager, enter the IP address of the LQ, as displayed on the front panel, into the URL field of your browser. If the unit is reachable over your network, this will take you to the **Overview** page of the CCM that is served by the unit.

Note: Default username and password for the CCM: **admin, admin**.

4.1 Minimum requirements for the CCM

Supported on the latest versions of all major web browsers (i.e. Google Chrome, Safari, Firefox, Internet Explorer).

4.2 Overview page

Linked units appear in this screen

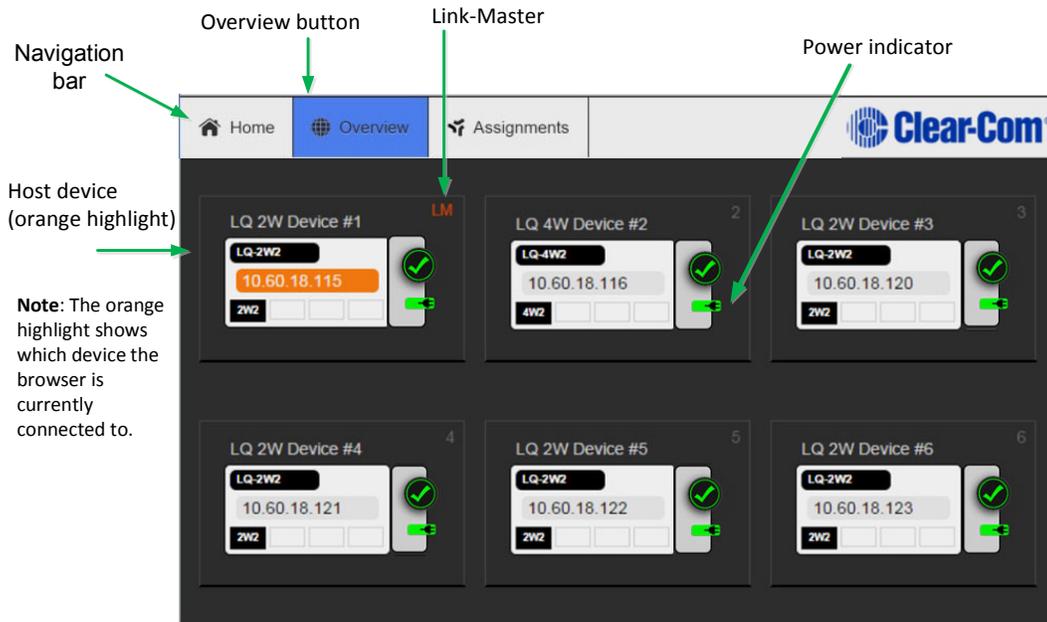


Figure 4-1 Overview page

As LQ devices are added to the group, they will appear in this screen. To access the configuration and control options for any one of the units in the group, click on the device object.

Note: The **Home** button takes you to the **General** page of the device your browser is connected to (the host device).

Note: There is a navigation bar at the top of the page: **Home**, **Overview**, **Assignments**.

Note: Please note that the device icon has a power indicator. See 3. Powering your LQ™ for more information on powering your device.

4.3 Device configuration

Once the units have joined a Link-Group, the devices can be configured either directly or by proxy, meaning that the configuration operations for a unit are routed through the host device. The host device is the unit which a browser is currently directed to (see **Figure 1-7 Configuring a Link-Group from any device in Overview**).

- The **Home** button will always take you to the host device's configuration page.
- Proxy configuration can be accomplished by clicking on any device within the **Devices** page.

4.3.1 General page

From this page you can: re-name the device, identify the device's model name and software version, and access **Upgrade**, **Change password** and **Maintenance** sections.

There are four buttons in the left margin, below the device image. These are: **General**, **Network**, **Linking** and Port options, **A/B**. Port options will display settings for 2-wire or 4-wire connections depending on the type of device you are using. Click on a button to access a configuration page.

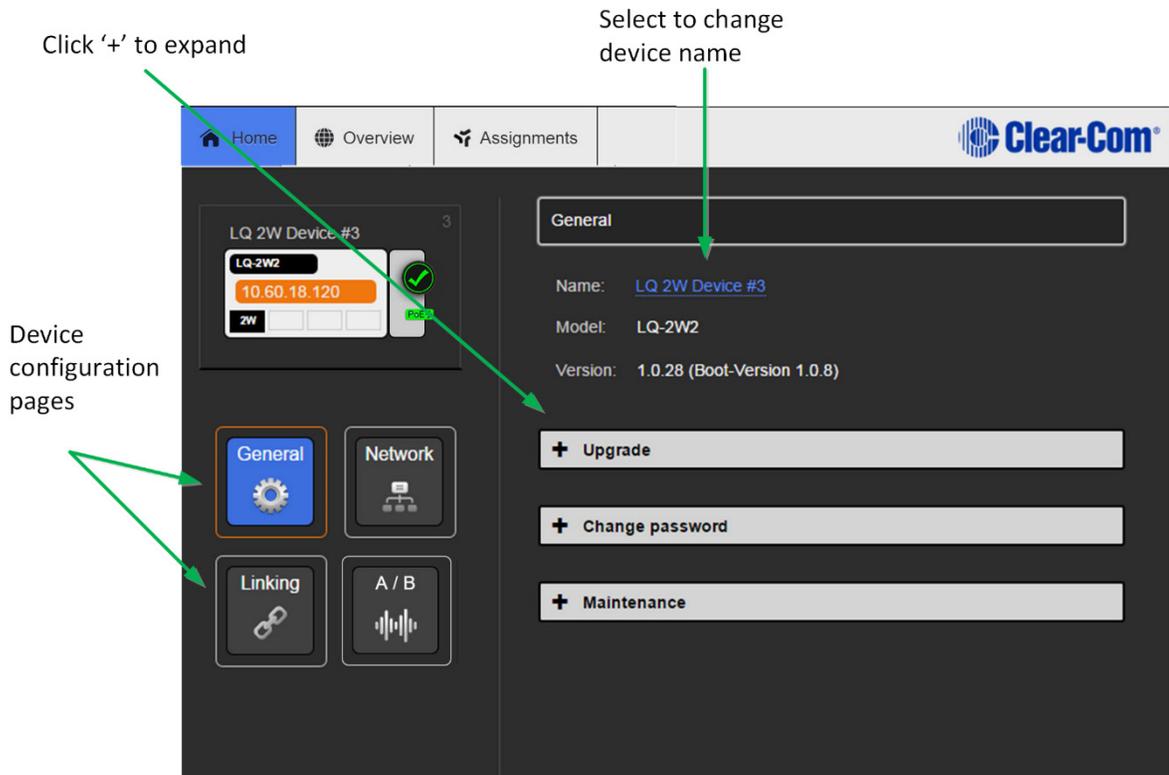


Figure 4-2 General page

4.3.1.1 Changing a device name from the General page

To change a device name, click on the existing name and enter a new one. Either press the <ENTER> key or click the blue check mark to apply changes.

4.3.1.2 Upgrade

To upgrade your device, see **13 Upgrading your device**.

4.3.1.3 Change password

Change the password to the Core Configuration Manager local to that device.

4.3.1.4 Maintenance

Reset the unit to factory settings, reboot the system or create a support archive in this section.

Support Info provides a 'snapshot' of the device's operational information for troubleshooting purposes.

4.3.2 Network information page

The LQ unit's network information is configured on this page.

4.3.2.1 DHCP or static IP allocation

DHCP is set by default and allows the device to automatically configure its network information.

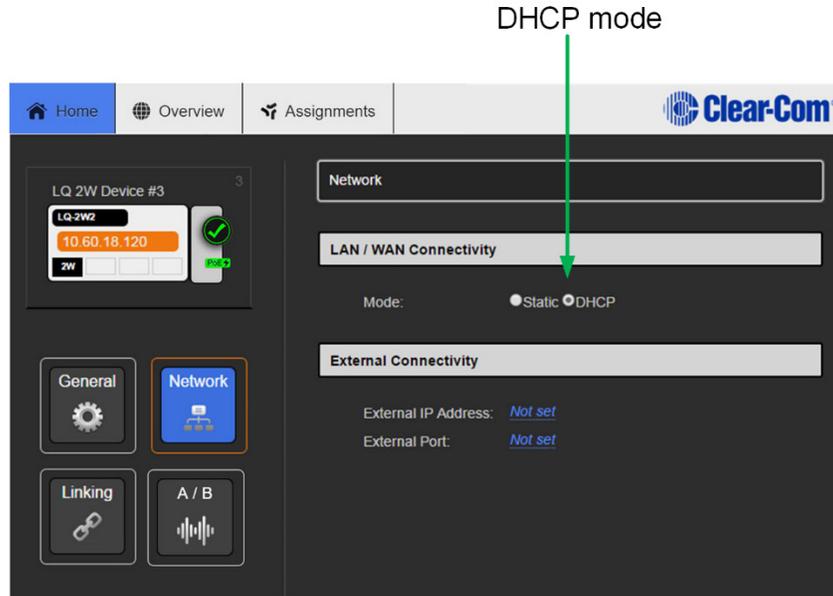


Figure 4-3 Network: DHCP mode

In some cases you may have to allocate the network information statically. See Fig. 4-4 below.

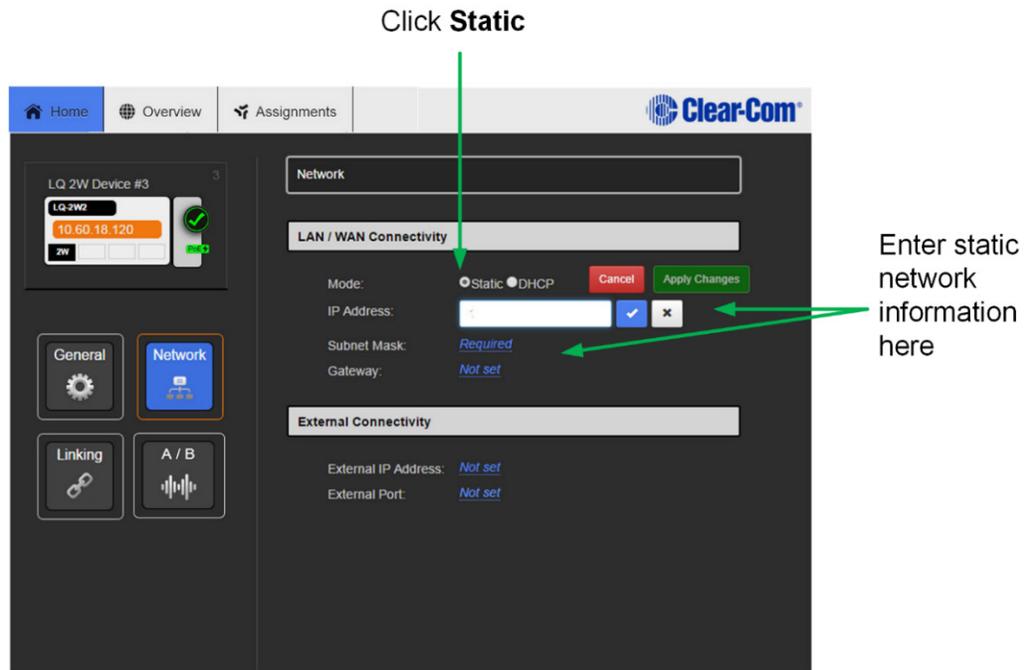


Figure 4-4 Network: static IP allocation

For more information on external connectivity see **9 Network configuration**.

For more information on static IP allocation see **9 Network configuration** and **5 Linking**.

4.3.3 Linking page

This is where the role of the LQ device is set to either Link-Master or, if connecting to a Link-Group, Link-Member.

Each group must have a Link-Master, which is the default mode of operation.

Each Link-Member in the group must be linked to the Link-Master here.

To join a Link-Group:

- 1) Configure Link-Member role.

Change Role to Link-Member

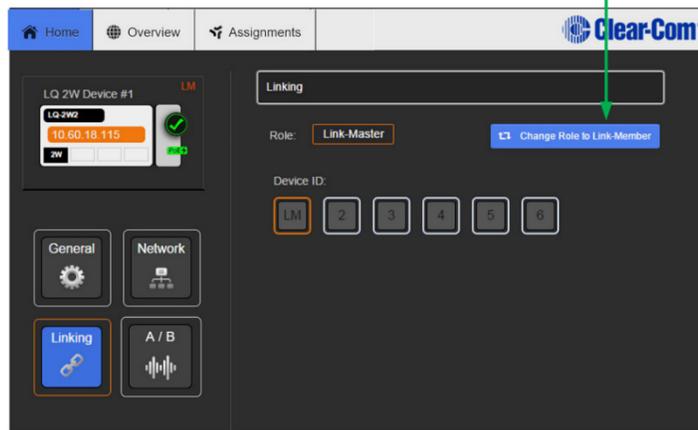


Figure 4-5 Linking: assign role to device

Note: The **Change Role** button toggles between Link-Member and Link-Master.

- 2) Query Link-Master for list of available Device IDs within the Link-Group.

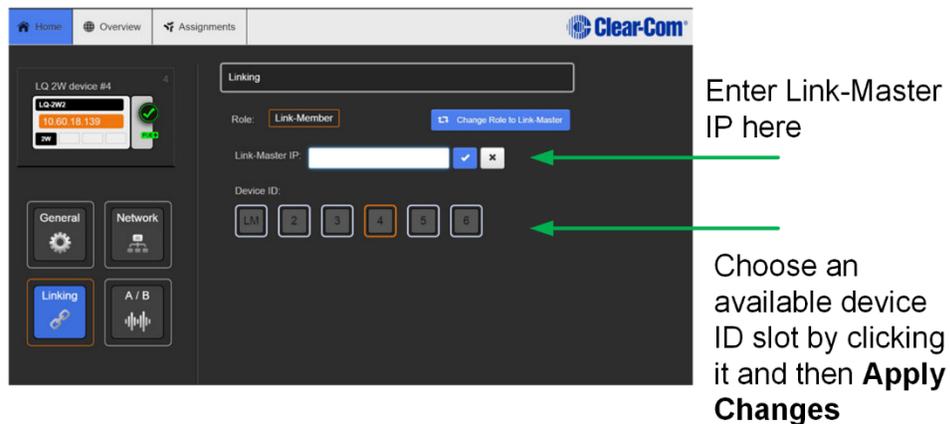


Figure 4-6 Linking

- 3) Select one of the available Device IDs and click **Apply Changes**. For more detail on the linking process see **2.3 Create a Link-Group**. For more on the Link-Master role and its effects see **5 Linking**.

4.3.4 Port configuration

This is where you will configure the audio interface.

For more detail on port settings see **10 Interface port configuration**.

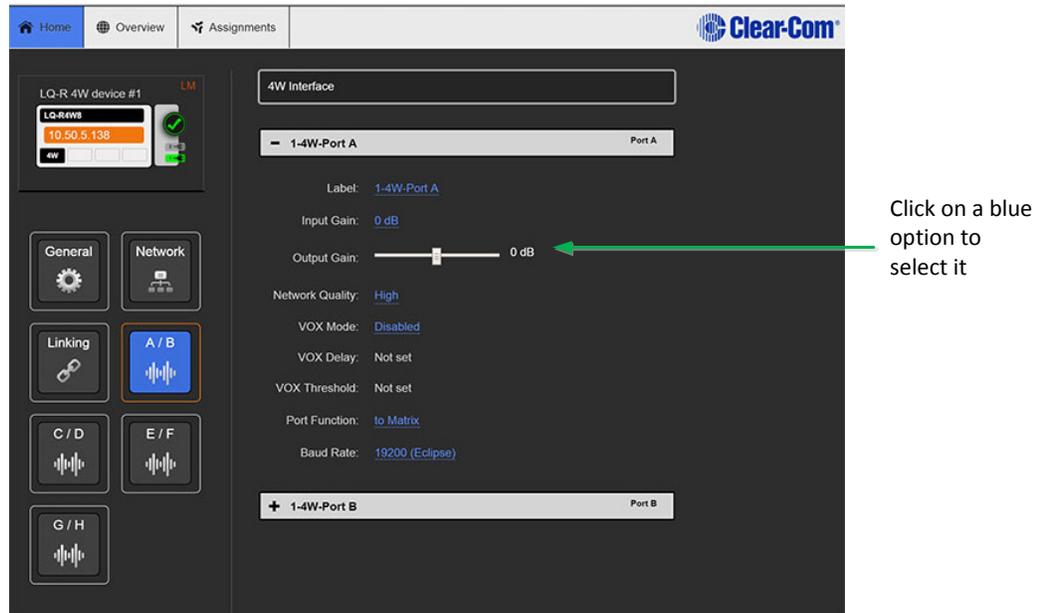


Figure 4-7 Four-wire interface port settings

4.4 Assignments page

Click **Assignments** on the top menu bar.

All devices joined to the Link-Group, along with their associated ports, appear in the left margin of this page. You will also see two page tabs on the centre right of the page; **Partyline** and **4-wire direct**. Choose either tab, depending on whether you wish to configure a virtual partyline channel or a 4-wire direct (panel) connection.

4.4.1 Configuring a partyline channel

- 1) Select the **Partyline** tab.

The six customizable channels are shown in the main area of the page.

To associate a port to a channel:

- 2) Select the channel by clicking on it
- 3) Go to the devices in the left hand margin of the screen and add ports to a channel by clicking '+'.

You will see the assigned sources appear inside the allocated channel.

- 4) To remove a port from a channel click '-'.

Note: A port can only be assigned to one channel at a time.

Port assignment status is represented by the following three colors:

- White: connected, audio is being transmitted
- Yellow: connection pending, connection status unknown
- Red: device is unreachable.

Note: If required, more channels can be added using the green 'Add Channel' button.

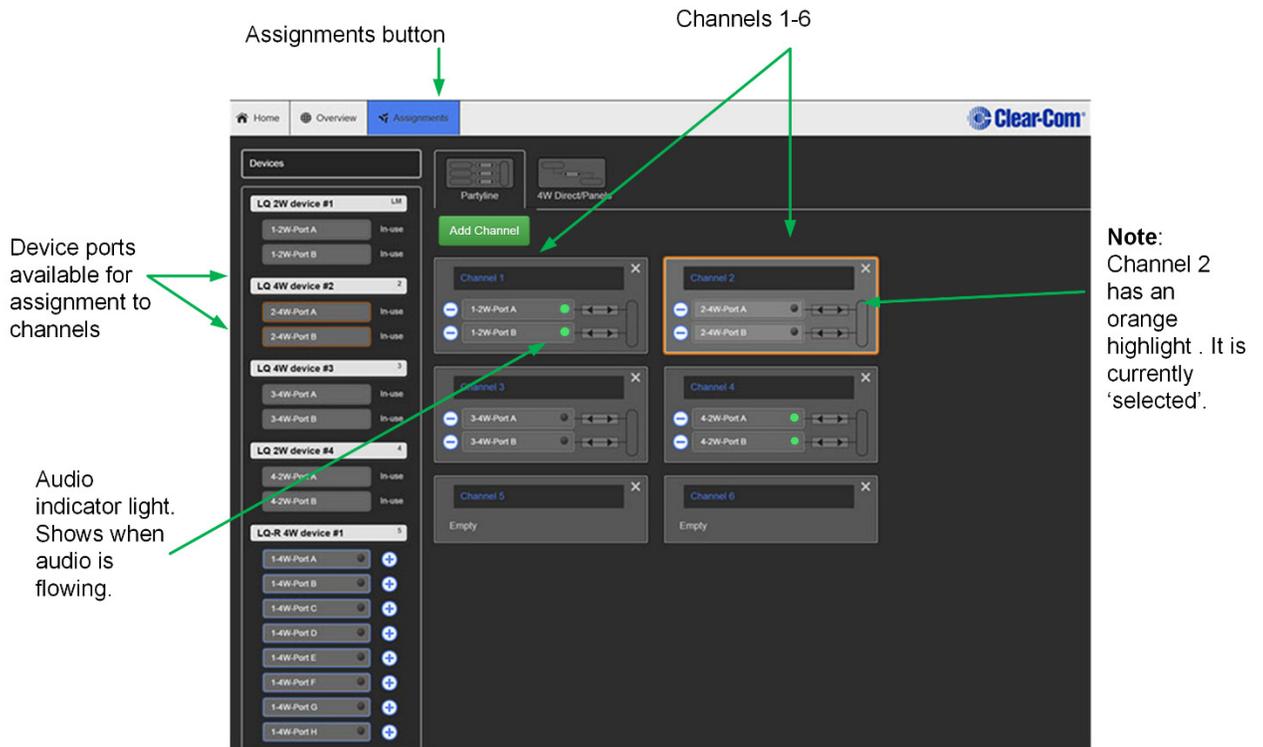


Figure 4-8 Assignments page

4.4.2 Configuring a 4-wire direct/panel

- 1) Select the **4W Direct/panel** tab.
- 2) Click the green **Add Direct Connection** button. A direct connection box appears on the page with an orange highlight to indicate that it is actively selected.

To associate a port to a direct connection:

- 3) Make sure the direct connection box is selected (orange highlight). Click the box to select if necessary.

- 4) Go to the devices in the left hand margin of the screen and add a port to a direct connection by clicking '+'.
- Note:** You can only add a 4-wire source in this context.
- 5) Select the second source from the devices in the left margin and click '+'. This source will also appear in the direct connection box and a connection will be created between the two ports.
 - 6) To remove a port from a direct connection click '-'.

4.4.3 Changing channel/4-wire direct labels in the Assignments page

To change the name of a channel or 4-wire direct connection:

- 1) Click on a blue channel/4-wire direct name.
- 2) Enter a new name into the white dialogue box and click the blue check mark to apply changes.

Note: Channel and 4-wire direct names can only be modified when the Link-Master is operational.

5 Linking

5.1 A Link-Group

- A Link-Group can contain up to 6 LQ devices
- A Link-Group must have one unit designated as Link-Master
- The Link-Group performs a “best effort” approach to creating a mesh network between all the devices within the group.

Once joined to the Link-Group, all devices attempt to connect to all other devices within the group.

A Mesh Network

- Configuration and control of any device is possible through any other unit in the group
- Configuration information is both distributed and persisted within every node of the group
- Significantly reduces loss of service

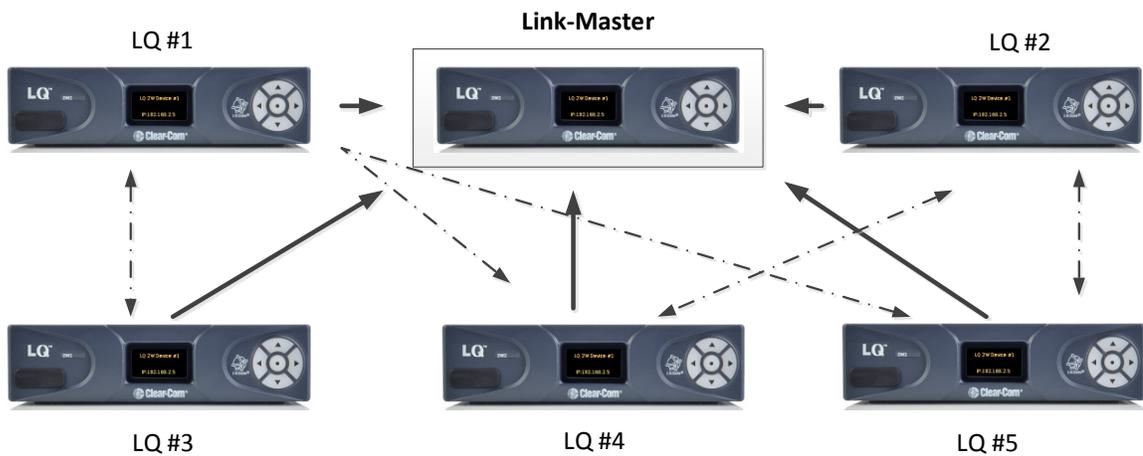


Figure 5-1 A mesh network

5.2 The Link-Master role

The Link-Master role serves three main purposes:

- 1) It facilitates Link-Group membership.
- 2) It is the owner of channel names, meaning that channel names will only persist (be maintained consistently) if the Link-Master is operational.
- 3) It is responsible for the synchronization and distribution of both configuration and device availability status throughout the Link-Group.

- Note:** The Link-Master must be reachable on TCP port 80 by all devices within the Link-Group. Reachability of the Link-Master on TCP/UDP port 655 facilitates the routing of audio to/from the Link-Master but is not mandatory when setting up a Link-Group.
- Note:** It is recommended that the IP address of the Link-Master is allocated statically. When allocated by DHCP the IP address can change. If this happens the LQ devices will no longer be able to reach the Link-Master device.
- Note:** Any device can be set to Link-Master mode which is the factory default setting.

5.3 The Link-Member role

LQ devices that are not designated master will have the role of Link-Member. Joining a device to a Link-Group requires that device to be set to Link-Member role which will prompt the user to enter the address of the Link-Master.

If a Link-Member device loses connection to its Link-Master, the front panel LED will turn red until that connection is restored.

5.4 Linking units

The only way to join devices to a Link-Group is through the Linking page of the CCM. Only the IP address of the Link-Master is required during this set up.

See **2.3 Create a Link-Group** for detailed instructions.

5.5 Linking over a LAN

This is the simplest way to link devices together. This type of environment enables the highest potential level of communication quality and the best availability of resources.

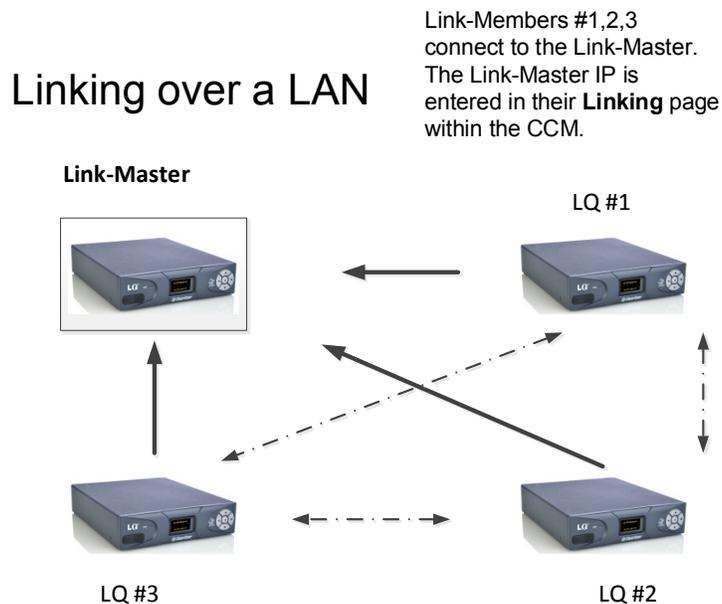


Figure 5-2 Linking over a LAN

5.6 Linking over Internet or WAN

When linking over Internet or WAN, the IP addressing of the units becomes more complicated because the units use external addressing and port-forwarding to navigate firewalls. The LQ units must be able to reach the Link-Master.

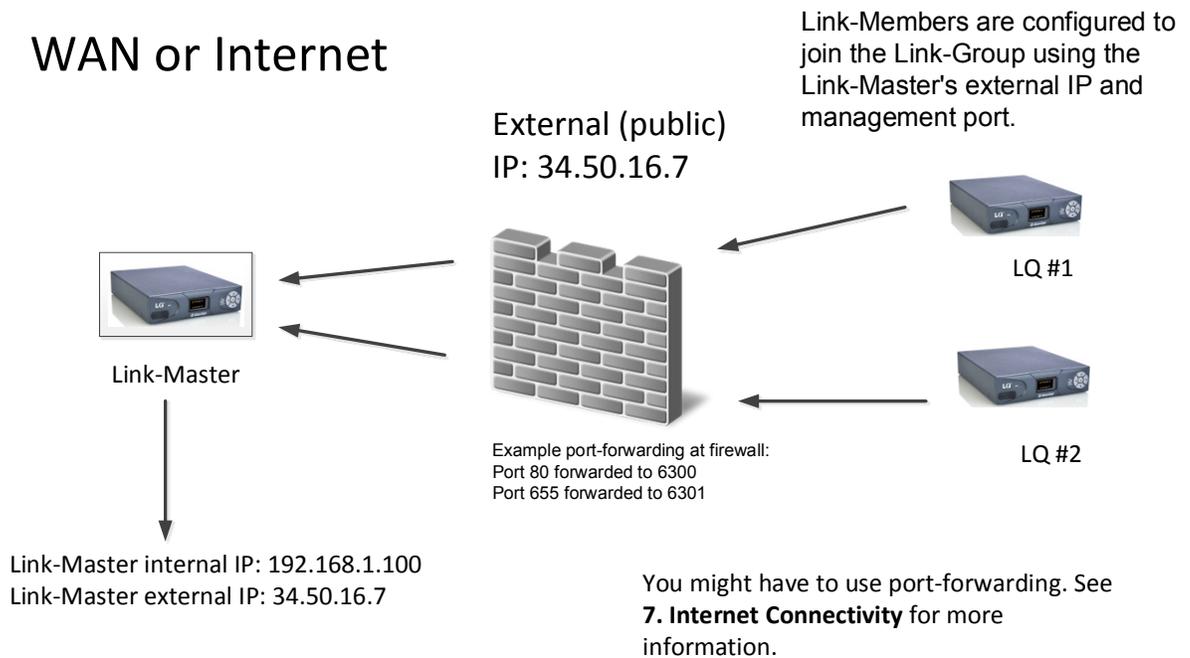


Figure 5-3 Linking over WAN or Internet

The Link-Master uses TCP port 80 for management and TCP/UDP port 655 for audio. You will need to create port-forwarding rules within your firewall to make these ports externally accessible to the Link-Master device.

The Link-Master's external IP and port will need to be configured within the **Network** page of the CCM.

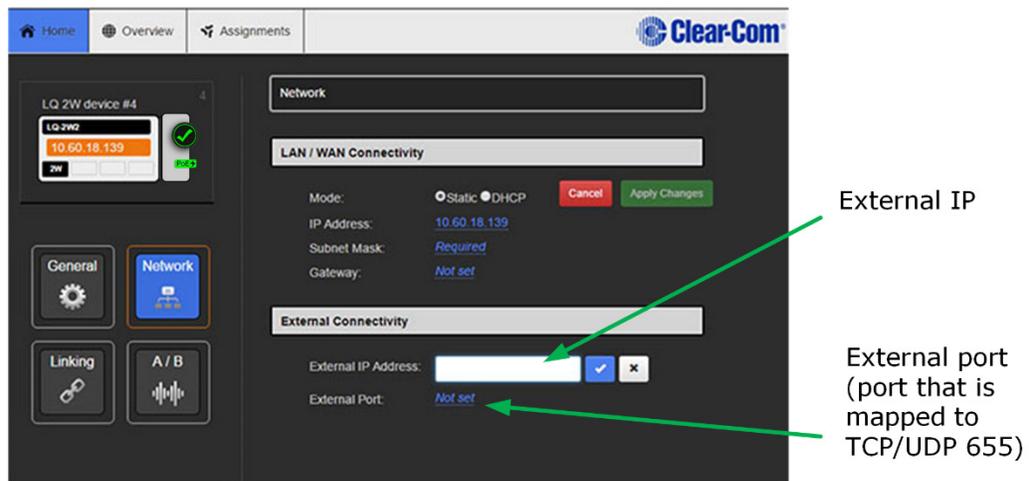
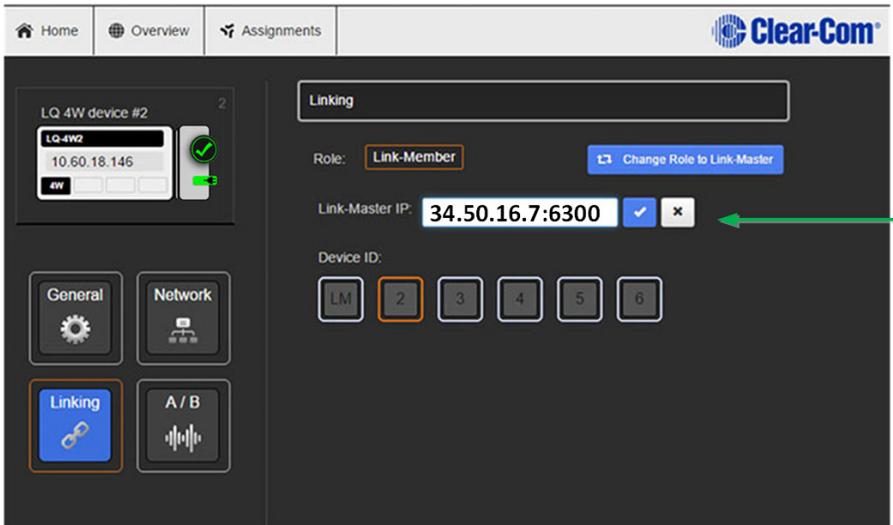


Figure 5-4 External IP addressing of the Link-Master



Linking over a firewall

Link-Master IP address configured in Linking for the member units is the external IP and the port mapped to TCP port 80 at the firewall

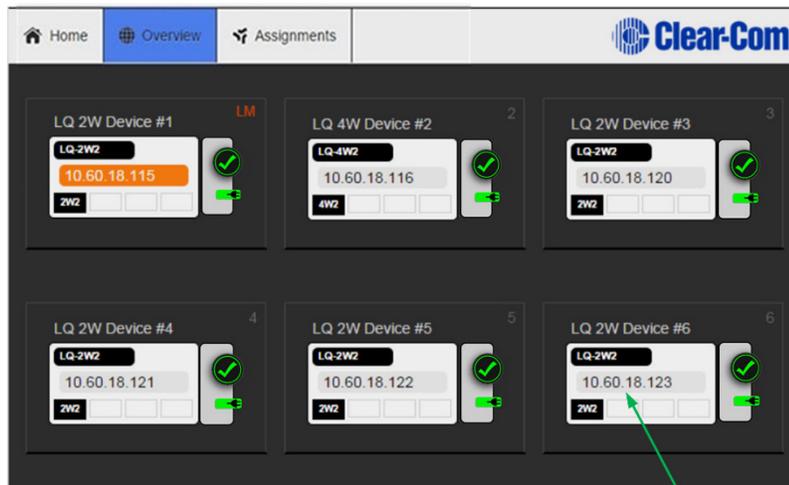
Figure 5-5 Linking: external Link-Master IP address entered in Linking page of member units

For more information on linking over the Internet, see **7 Internet connectivity**.

5.7 How to remove a device from a Link-Group

5.7.1 Remove an on-line Link-Member from a group

- 1) Access the Core Configuration Manager for any device within the Link-Group.
- 2) In the **Overview** page, click on the device image of the unit that you wish to remove from the group.



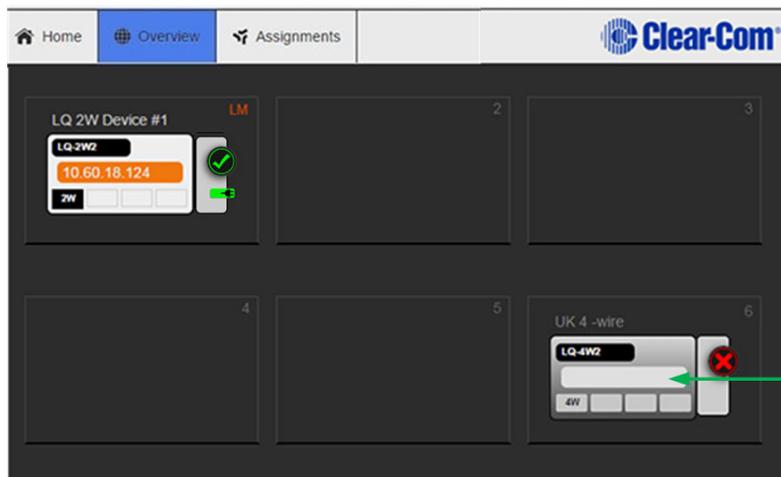
Click on the device you wish to remove from the group

- 3) Navigate to **Linking** for that device.
- 4) Click **Change Role to Link-Member**.
- 5) **Apply Changes**.

The device will be reconfigured as a Link-Master and removed from the group.

5.7.2 Remove an off-line Link-Member from a group

- 1) Access the Core Configuration Manager for any device within the Link-Group.
- 2) In the **Overview** page, the off-line unit will show a red 'X'. Click on this device.



Click on the off-line device you wish to remove from the group

- 3) You will be asked if you want to remove this unreachable device. Click **Delete**.

The device will be removed from the Link-Group. It will not be reconfigured as a Link-Master.

6 *Front panel interface walk-through*

From the front panel of the LQ you can:

- Set audio configuration
 - input gain
 - output gain

- Set VOX configuration
 - VOX
 - Threshold
 - Delay

- Set 2-wire specific settings
 - Powering of the line
 - Clear-Com/RTS mode
 - Auto-nulling
 - Termination

- Set 4-wire specific settings
 - Port Function: set port function of Ethernet cable 'to Matrix' or 'to Panel',
 - Vox levels
 - Baud rate

- Set device settings
 - Brightness of OLED
 - Screensaver time-out
 - Reboot
 - Reset-to-default

- Display only
 - Networking: mode, IP, MAC.

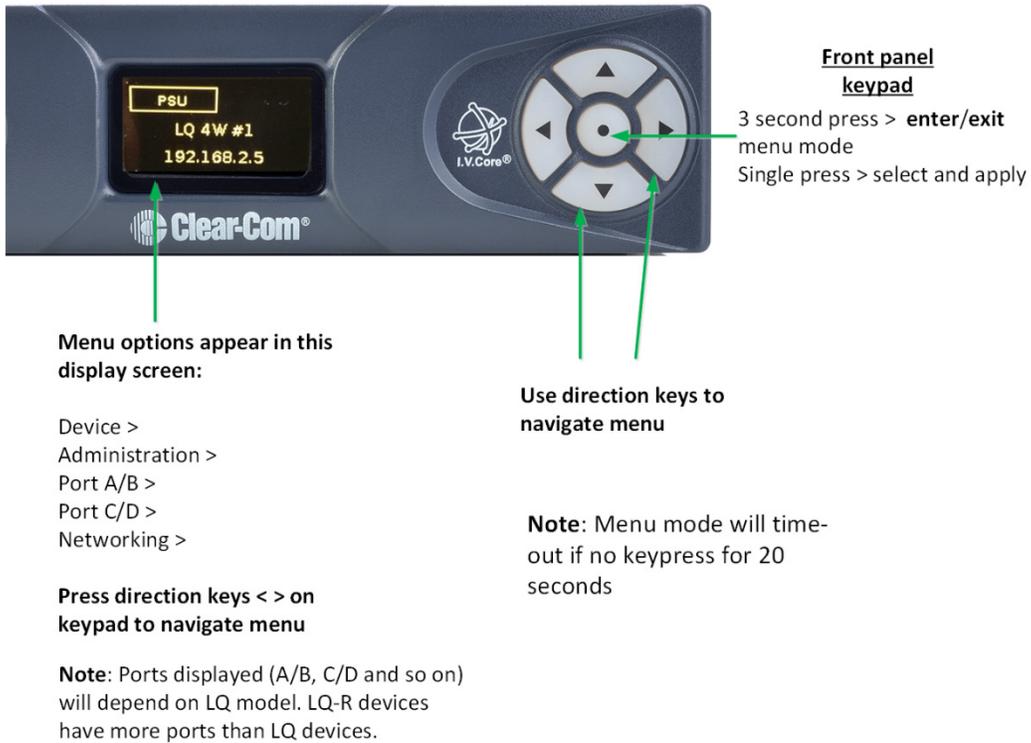


Figure 6-1 Front panel menu

6.1 Administration

- Version
- Reboot
- Reset to factory default

6.2 Audio

Note: The parameters in bold are defaults.

2-wire port A/B	4-wire port A/B
<ul style="list-style-type: none"> • Auto-null > Start • Line termination <ul style="list-style-type: none"> ◦ Enabled/Disabled • Input gain <ul style="list-style-type: none"> ◦ -3 to +3 dB • Output gain <ul style="list-style-type: none"> ◦ -3 to +3 dB • Vox <ul style="list-style-type: none"> ◦ Disabled/Threshold/Adaptive • Vox threshold <ul style="list-style-type: none"> ◦ -18 to -60 dB (default -40 dB) • Vox delay <ul style="list-style-type: none"> ◦ 0.5 to 4 seconds • Power of line <ul style="list-style-type: none"> ◦ Enabled/Disabled • Mode <ul style="list-style-type: none"> ◦ Clear-Com/RTS 	<ul style="list-style-type: none"> • Port Function <ul style="list-style-type: none"> ◦ to Matrix/to Panel • Input gain <ul style="list-style-type: none"> ◦ 12 to +12dB • Output gain <ul style="list-style-type: none"> ◦ 12 to +12 dB • Vox <ul style="list-style-type: none"> ◦ Disabled/Threshold/Adaptive • Vox threshold <ul style="list-style-type: none"> ◦ 0 to -42 dB (default -22 dB) • Vox delay <ul style="list-style-type: none"> ◦ 0.5 to 4 seconds • Baud rate <ul style="list-style-type: none"> ◦ 9600 (Drake 4000)/19200 (Eclipse)

6.3 Device

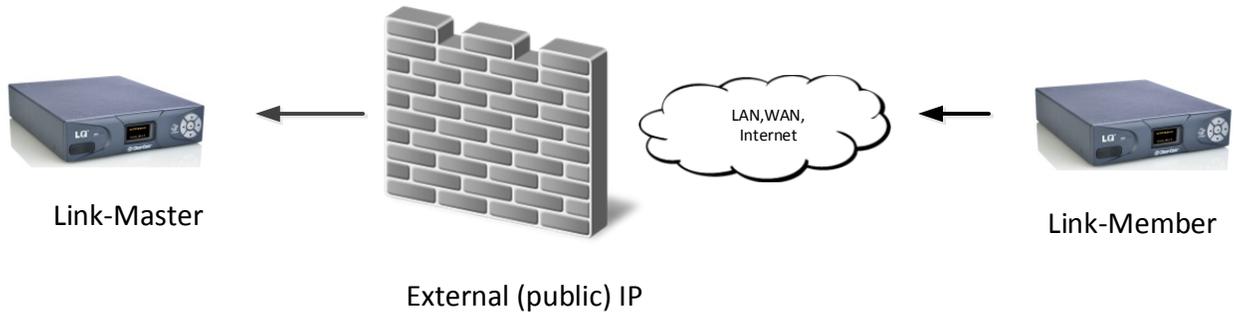
Note: The parameters in bold are defaults.

- OLED brightness
 - Bright/**Normal**/Dim/Very Dim
- Screensaver
 - 15/30/60/90/**120** seconds

6.4 Networking (information display only)

- Mode > Static/**DHCP**
- IP address
- MAC address

7 Internet connectivity



All devices within a Link-Group must have connectivity to the Link-Master on TCP port 80. When linking devices over the Internet, make sure that this connectivity is stable. Internet connection to an LQ device requires special configuration within your firewall (port-forwarding).

7.1 Getting an external IP address

When networking LQ devices over the Internet, an external IP address is required as a first step in making sure Link-Members can reach the Link-Master. The external (public) IP address must be static and non-changing. Normally an Internet Service Provider (ISP) will provide external addressing in Dynamic Host Configuration Protocol (DHCP) mode. This is not guaranteed to remain static but instead will change periodically. This will cause linking issues as the LQ devices will not be able to reach the master if the IP address changes. Therefore, it is suggested that you purchase a static address from your ISP. Failure to do this could result in a loss of service.

Note: Another alternative is to maintain DHCP addressing but use the Address Reservation feature available in most managed routers. This will instruct the router to allocate a specific DHCP address to an LQ device identified by its MAC address. The unit's MAC address can be retrieved through the LQ's front panel menu.

7.2 Port-forwarding

In order to facilitate connectivity to an LQ unit that is behind a firewall, certain ports need to be mapped from your firewall to the LQ device. This mapping will forward traffic received on those ports from the Internet directly to the LQ unit.

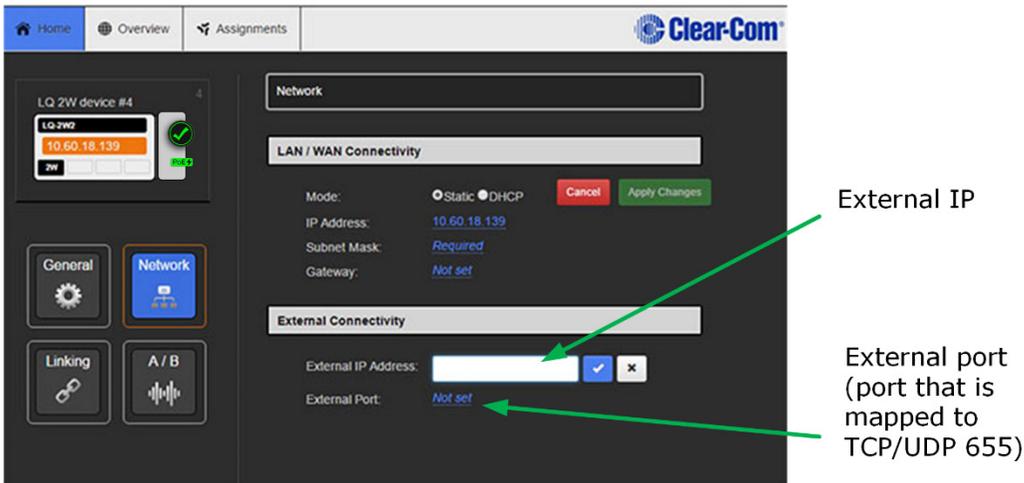
- The Link-Group uses TCP port 80 for link initiation and Web management.
- All the units use port 655 (TCP and UDP) for group connectivity and audio transmission.

7.3 How to configure the Link-Master to be externally reachable

Both the external IP address and the audio port forwarded within the firewall will need to be configured within the Link-Masters device configuration page.

7.3.1 Set Link-Master external IP address

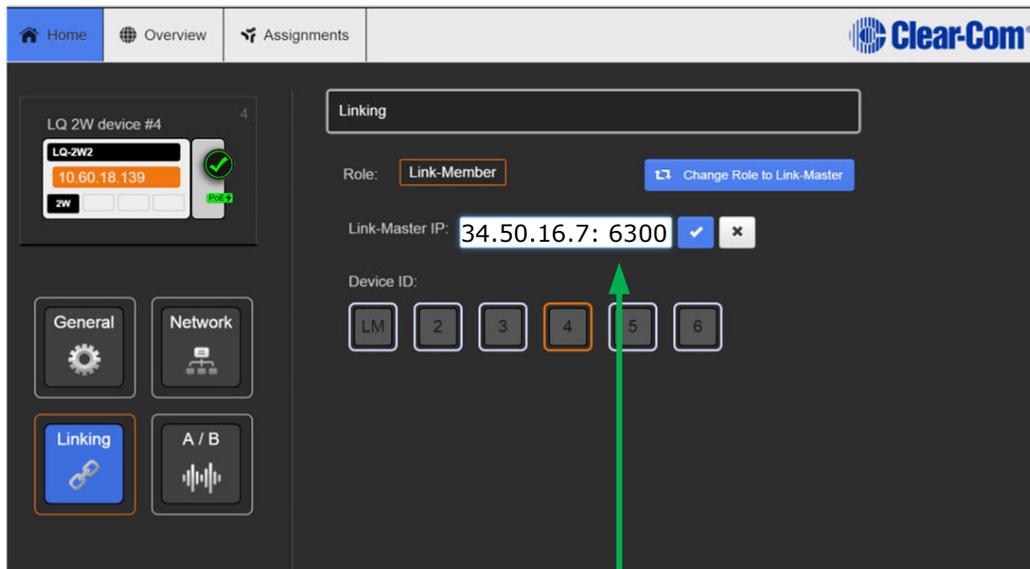
- 1) Navigate to the Link-Master's network configuration page by clicking on the Link-Master device in the **Overview** page and then the **Network** button.
- 2) Enter the external IP address which the Link-Master will be reachable from.
- 3) Enter the Port configured within the firewall that maps to the LQ device's audio port (TCP/UDP: 655).



7.3.2 Link devices to the remote Link-Master

- 1) Join an LQ device to the Link-Group by entering the IP address of the device, as displayed on the front panel, into your browser.
- 2) Navigate to the **Linking** page for that device and click **Change Role to Link-Member** (if currently in Link-Master mode).
- 3) Enter the Link-Master's external IP address and management port using the format [IP:Port].

Note: This must be the port that is mapped to port 80 within the firewall



Link-Master IP and external port if required.

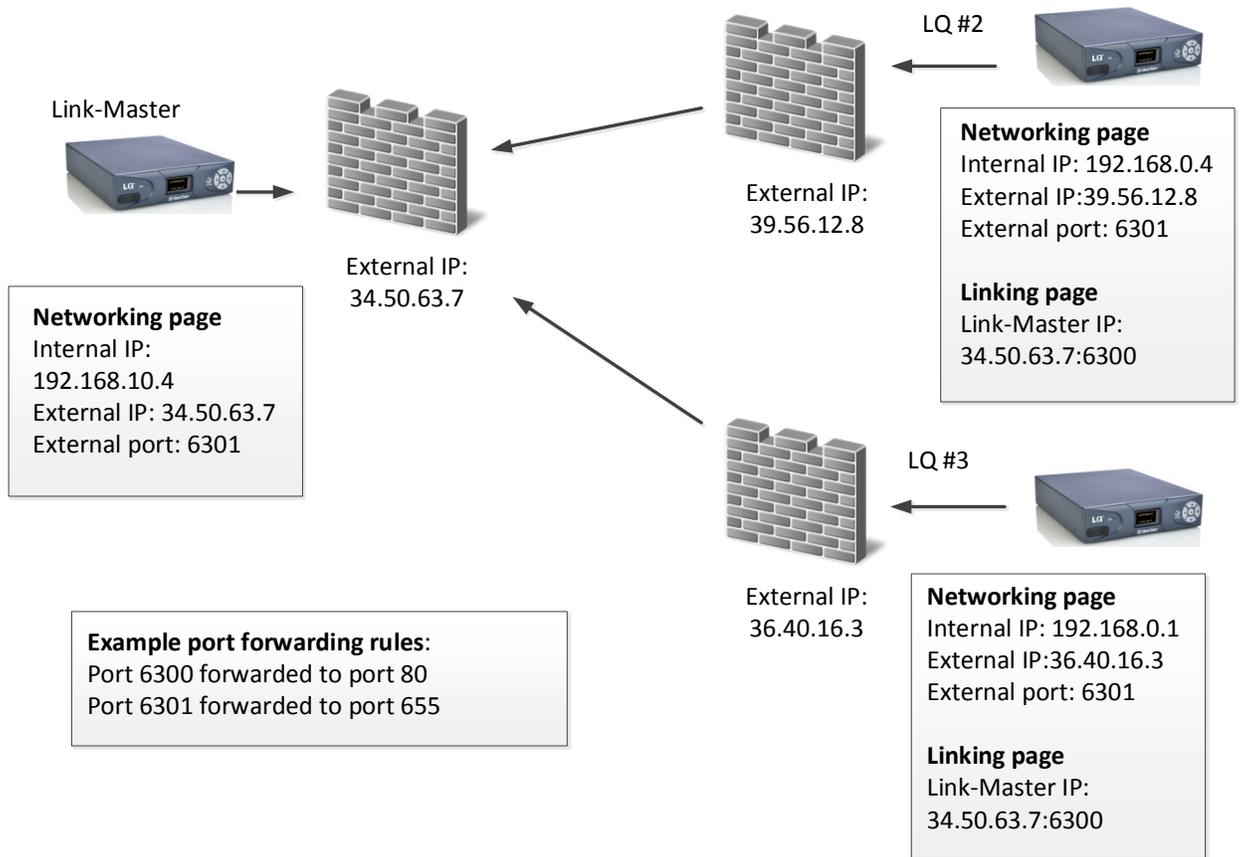
- 4) If the Link-Master is reachable on its management port, the available device IDs will be highlighted. Select one of the blue highlighted IDs and click **Apply Settings**.
- 5) Once the devices are successfully linked, all Link-Members will appear within the **Overview** page.

7.4 How to configure Link-Members to be externally reachable

Clear-Com recommends that all units in a Link-Group are reachable over the Internet. In some cases this will mean external (public) addressing of the Link-Members in a group as well as the Link-Master. This prevents a loss of service if the master is unobtainable for any reason and creates more efficient audio routing. Setting an external IP and interface port on individual Link-Members will reduce the risk of loss of connection if the Link-Master is unavailable.

Perform the following steps if connecting Link devices across more than two firewalls:

- 1) Navigate to the **Networking** page on each Link unit and input the external IP address and port number. See below for example IP addresses and port-forwarding.



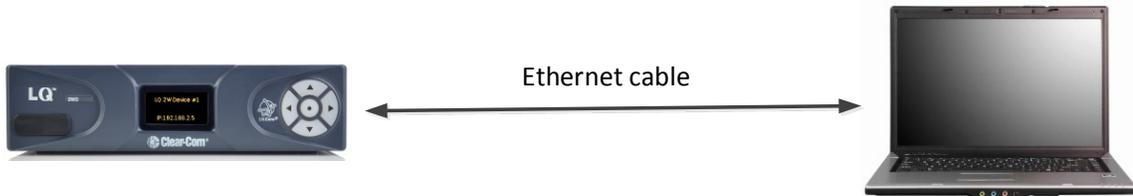
Note: The external port set on the **Networking** page is the interface port (655), in this example port-forwarded to 6301.

Note: The external port set on the **Linking** page is the management port (80), in this example port- forwarded to 6300.

8 Link-local environments

Link-local mode

- Any networked device will enter link-local mode if it is set to DHCP and no DHCP server is detected on the network.
- If both the laptop and the LQ device are in DHCP mode, they will revert to link-local when connected. This means they can communicate with one another as they are both on the same subnet (169.254.xx.xx).



8.1 What is link-local?

A link-local address is an IP address within the local segment of any network. Routers do not pass information to these as link-local addresses are not guaranteed to be unique beyond a single network segment. When first connected to a network, your LQ device will attempt to get an IP address via Dynamic Host Configuration Protocol (DHCP). If no DHCP server is available the unit will automatically enter link-local IP mode. A link-local IP address will take the form: 169.254.xxx.xxx.

8.2 Accessing an LQ unit when in link-local mode

To access the CCM of an LQ unit in link-local, you must connect to it from a PC that is also in link-local mode.

Devices will revert to link-local mode if they are configured to DHCP and fail to find a DHCP address on the network or device they are attempting to connect to. A PC can be put into link-local mode by ensuring it is in DHCP mode and connecting it to the LQ unit that is in link-local with a standard Ethernet cable. The PC will look for a dynamically generated IP address (DHCP), and when it does not find one will enter link-local mode automatically.

Once the PC is connected to the LQ and in link-local mode, you can connect to your LQ unit by opening a browser window on the computer and inputting the unit's IP address (from the front panel display) into the address field. This takes you to the Core Configuration Manager where you can configure the device as usual.

Note: The units will operate in link-local, but for optimum performance it is recommended that they are used with either static or DHCP network settings.

9 Network configuration

9.1 Dynamic host configuration protocol (DHCP) configuration

The default method for LQ devices to obtain an IP address is DHCP and this is the preferred method when setting up a Link-Group over a LAN.

Most networks allocate IP addresses using DHCP. The addresses provided are dynamic and will change from time to time.

9.2 Static configuration

DHCP is not recommended for the Link-Master and is not recommended for units linked to the master in some situations. An example of this is when the Link-Group has to navigate 2 or more firewalls.

In these cases you will allocate the network settings statically. To do this, navigate to: **Device** > **Network** in the Core Configuration Manager. See Fig. 9-1 below.

Click **Static** to access static IP options

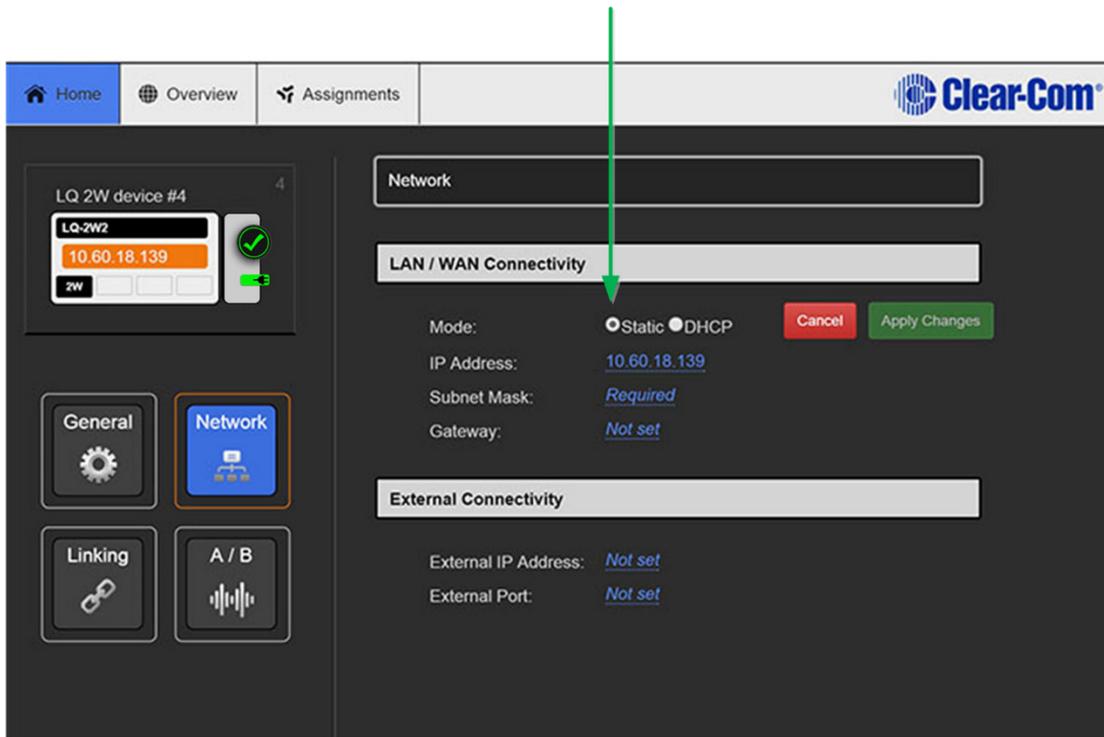


Figure 9-1 Core Configuration Manager, networking page

9.2.1 Netmask or subnet

The netmask or subnet divides the network into sectors for more efficient routing and is required when allocating a static IP address to an LQ device.

9.2.2 Gateway

Entry of this setting is optional. You will use it if setting up a Link-Group to navigate across subnets. If it is not explicitly stated, the system will revert to the device IP address.

9.3 Configuring an external IP address

You will use an external or public IP address when routing LQ devices over firewalls (this will almost always be the case when connecting over the Internet). A Link-Master connected to devices beyond a firewall will always use an external IP address and an external port. Link-Members will use external addressing and ports if connecting over firewalls also. See **7 Internet connectivity** for more detail on external IP addresses and ports.

10 Interface port configuration

10.1 Maximize bandwidth efficiency and audio quality

In the port-settings page of the CCM (configuration manager) you can adjust settings for each audio interface port within the Link-Group (up to 48 ports) on a per-port basis. This allows you to take network quality into account and maximize both audio quality and bandwidth efficiency.

Note: To minimize noise, use screened (shielded) cable when connecting 4-wire ports.

10.2 Call signaling and Remote Mic Kill (RMK)

Call signaling is automatic on all audio routes so a call signal can be routed to any destination (2-wire or 4-wire).

Note: Call signaling will be passed to some 3rd party intercom equipment, but it may not be recognized.

RMK is supported and passed through to 2-wire participants only.

10.3 2-wire port options

Note: Default option is in bold.

- **Power: Disabled/Enabled**

Enable power if you wish to power partyline beltpacks. See 3.1.3 Power 2-wire beltpacks from the partyline

Note: Enabling power will enable termination by default.

- **Mode: Clear-Com/RTS** (default is Clear-Com)

Note: For specific pin-outs see **15 Technical specifications**.

- **Label:** Clicking on a blue label header will allow you to change the name of the port. Enter the new name and click the blue check mark to apply changes.
- **Input/Output gain:** -3 to +3 dB
- **Network Quality:** Very Low/Low/Balanced/**High**/Very High/Custom

Note: The jitter buffer setting is designed to buffer audio received to prevent loss if there is network jitter. Please note that the jitter buffer selection will directly affect the latency. This is because the lower number in the jitter range represents the amount of time the LQ unit will buffer audio before delivering it to the port. A bigger jitter buffer setting will increase latency in milliseconds.

The **Custom** option within the **Network Quality** setting allows adjustment of the jitter buffer setting independent of bit rate and packet size.

- Bitrate: 16, 32, 48, **64**, 128 kbps
- Packet size: 5ms, **10ms**, 20ms, 40ms, 60ms
- Jitter: (min – max) 200 – 1000ms, 100 – 500ms, 60 – 200ms, 40 – 100ms, 20 – 60ms, **5 – 60ms**, to 3 – 60ms
- **VOX:** This setting maximises bandwidth efficiency by detecting when the line is silent and not transmitting at those times. Choose from 3 different settings:
 - **Disabled** (default)
 - Fixed Threshold (user specified)
 - Delay: **0.5** to 4.0 seconds
 - Threshold: -18 to -60 dB. Default **-40 dB**
 - Adaptive threshold. This is the Opus Codec’s own silence suppression (Discontinuous Transmission or DTX) mechanism. This option will implement comfort noise when silence is detected.
- **Termination: Disabled/Enabled**
- **Auto nulling option**

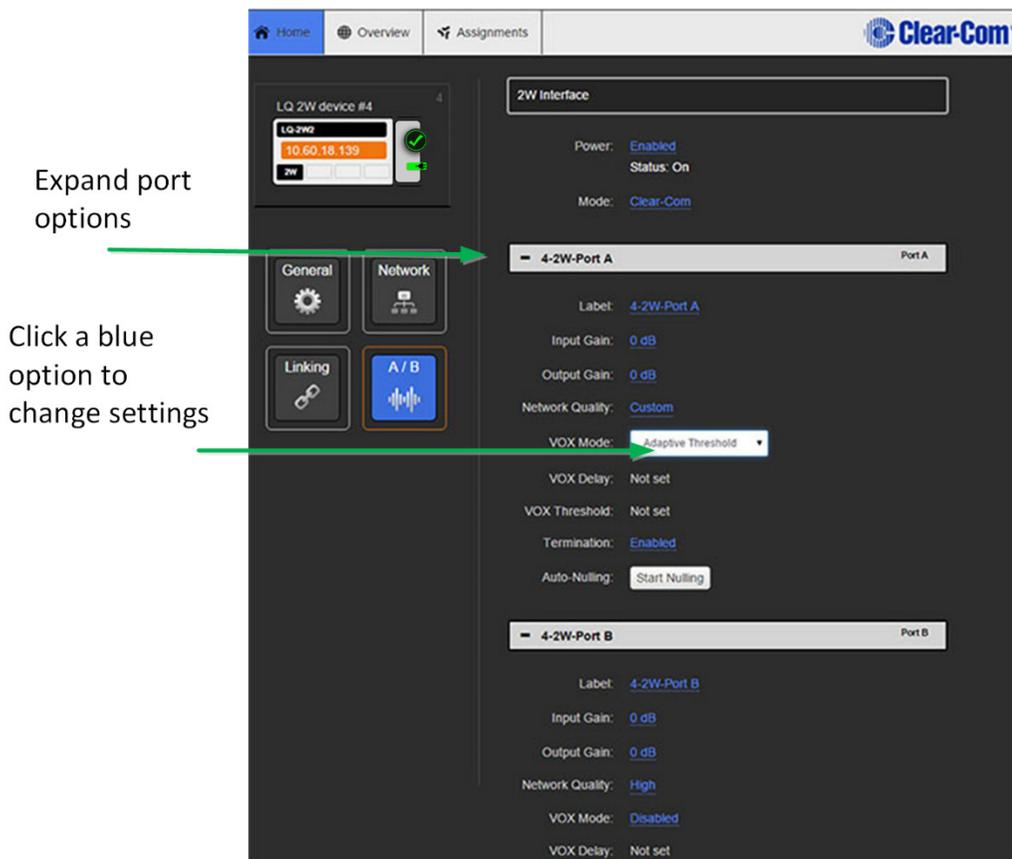


Figure 10-1 2-wire port options

10.4 4-wire port options

Note: To minimize noise, use screened (shielded) cable when connecting 4-wire ports.

Note: Default option is in bold.

- **Label:** Clicking on a blue label header will allow you to change the name of the port. Enter the new name and either press the <ENTER> key or click the blue check mark to apply changes.
- **Input/Output gain:** -12 to +12 dB
- **Network Quality:** Very Low/Low/Balanced/**High**/Very High/Custom

Note: The jitter buffer setting is designed to buffer audio received to prevent loss if there is network jitter. Please note that the jitter buffer selection will directly affect the latency. This is because the lower number in the jitter range represents the amount of time the LQ unit will buffer audio before delivering it to the port. A bigger jitter buffer setting will increase latency in milliseconds.

The **Custom** option within the **Network Quality** setting allows adjustment of the jitter buffer setting independent of bit rate and packet size.

- Bitrate: 16, 32, 48, **64**, 128 kbps
- Packet size: 5ms, **10ms**, 20ms, 40ms, 60ms
- Jitter: (min – max) 200 – 1000ms, 100 – 500ms, 60 – 200ms, 40 – 100ms, 20 – 60ms, **5 – 60ms**, to 3 – 60ms
- **Vox:** This setting maximises bandwidth efficiency by detecting when the line is silent and not transmitting at those times. Choose from 3 different settings:
 - **Disabled**
 - Fixed Threshold (user specified)
 - Delay: **0.5** to 4.0 seconds
 - Threshold: 0 to -42 dB. Default **-22 dB**
 - Adaptive Threshold. This is the Opus Codec's own silence suppression (Discontinuous Transmission or DTX) mechanism. This option will implement comfort noise when silence is detected.
- **Port Function** (sets pin polarity of Ethernet cable): to Panel /**to Matrix**
- **Baud rate**
9600 (Drake 4000)/**19200 (Eclipse)**

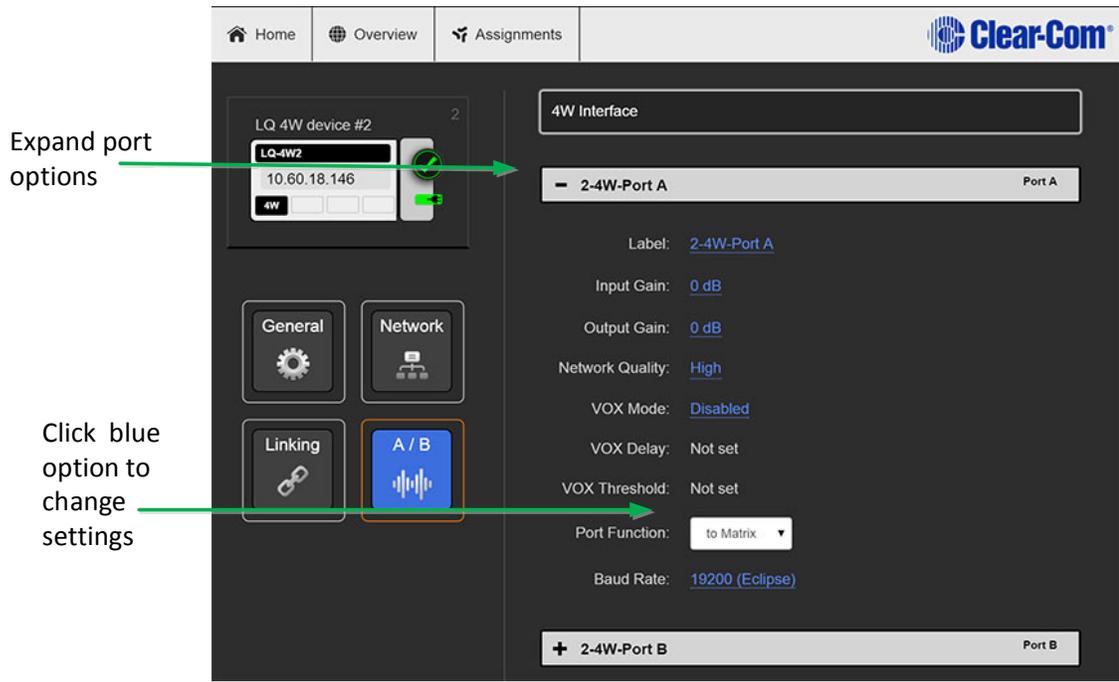


Figure 10-2 4-wire port options

11 Assignments

Audio can be assigned to either channels or 4-wire direct connections.

11.1 Channels

Note: A channel can be made up of multiple audio sources and routed anywhere within a Link-Group.

Once connected to the units, audio from the input/output ports on the back of the LQ devices can be assigned to any of the six available channels. The channels operate as virtual partylines. When an audio route from a port is assigned to a channel it will be able to talk and listen to any other ports assigned to that channel.

Channels 1-6

- Point-to-multipoint routing of both audio and call signaling
- Ability to mix 2W and 4W in one channel
- Channel operates as a virtual partyline

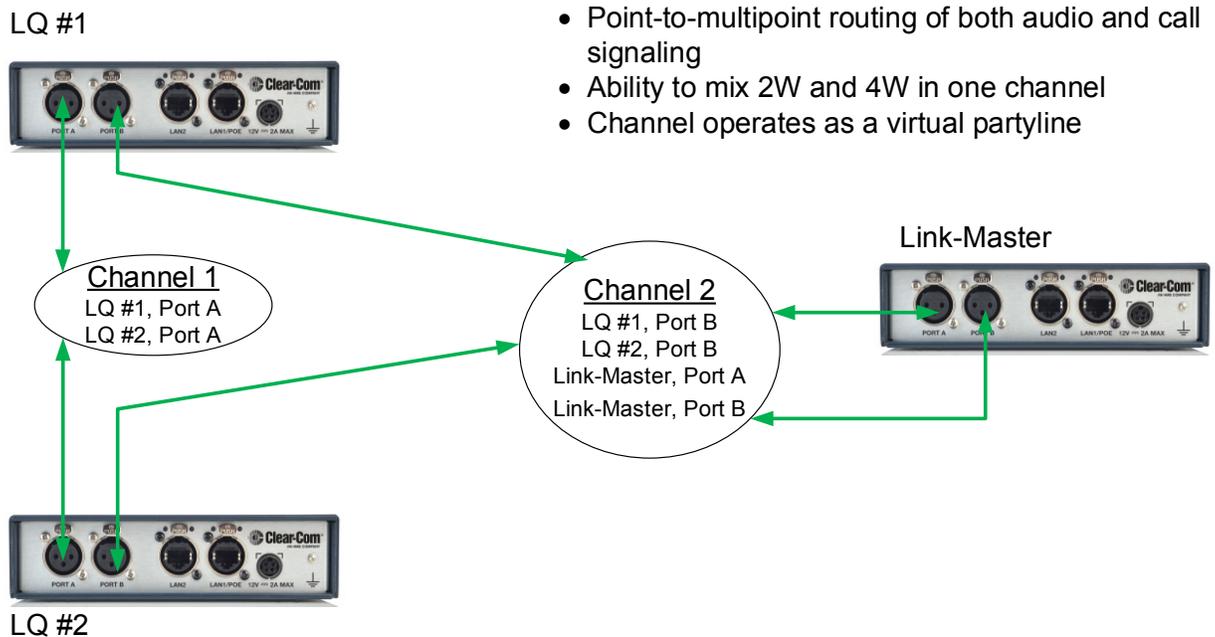
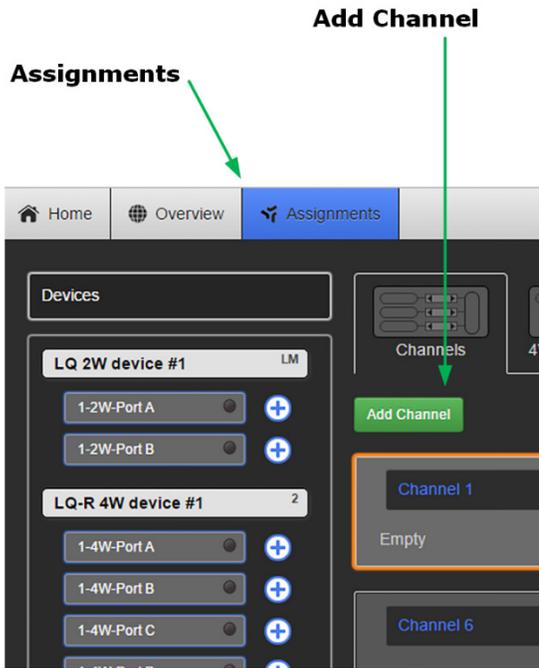


Figure 11-1 Audio channels in a Link-Group

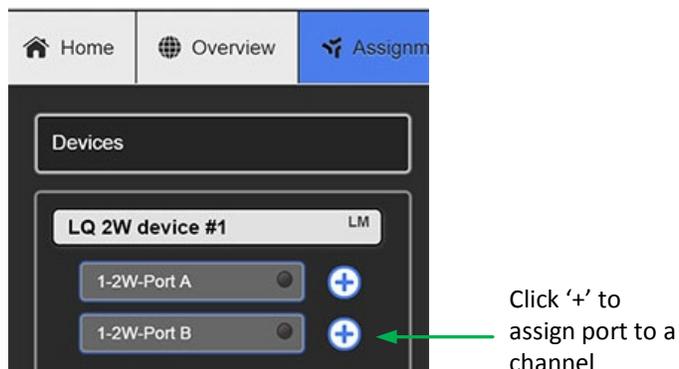
11.1.1 How many channels can I use?

LQ series units can provide more than 6 channels. Use the green 'Add Channel' button on the **Channel** tab in the **Assignments** page of the Core Configuration Manager (CCM) to add more channels.



11.1.2 Connecting ports

- 1) Ensure that the ports are connected to the rear of the LQ unit.
- 2) From the Core Configuration Manager, navigate to **Assignments**.
- 3) Select the **Channel** tab on the Assignments page.
- 4) Click on the channel you want to assign a port to.
- 5) Navigate to **Devices** in the left hand margin of the screen.
- 6) Assign the required port to the channel by clicking '+'.



- 7) You will see the interface port appear inside the channel.

- 8) To unassign the port from the channel click '-' within the channel.

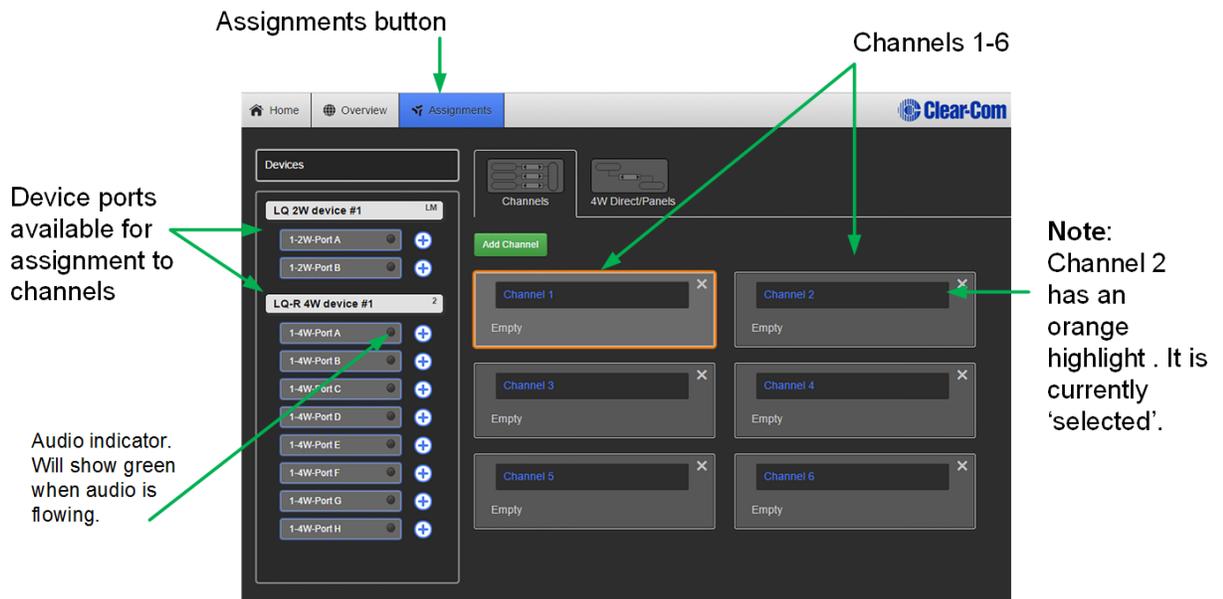


Figure 11-2 Assignments page

Note: A channel must be selected before ports can be assigned to it.

Note: A port cannot be assigned to a channel twice so it must be unassigned from a channel as necessary before assignment.

11.1.3 Port availability status

Port assignment status is represented by the following three colors:

- White: connected, audio is being transmitted
- Yellow: connection pending, connection status unknown
- Red: device is unreachable

11.1.4 Audio indicator

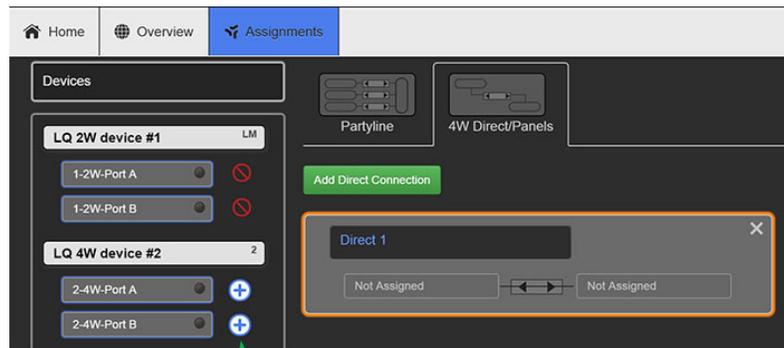
On the Assignments page you will see an audio indicator on ports and channels. This will light green when audio is flowing.

11.2 Audio configuration for a 4-wire direct/panel connection

Note: Unlike an LQ channel, which can contain multiple audio sources, a 4-wire direct/panel connection is between two ports. A 4-wire direct connection cannot be included in a channel and is configured separately.

- 1) Ensure that the ports are connected to the rear of the LQ unit.

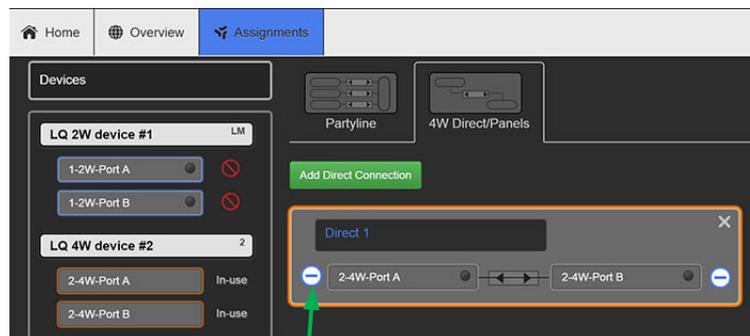
- 2) From the Core Configuration Manager, navigate to **Assignments**.
- 3) Select the **4-Wire Direct** tab in the Assignments page.
- 4) Click on the **Add Direct Connection** button to create a new direct connection box or select an existing direct connection box. Make sure the connection box you wish to add a port to has an orange highlight to indicate that it is selected.
- 5) Navigate to **Devices** in the left hand margin of the screen.
- 6) Assign the required port to the direct connection by clicking '+'.



Click '+' to
assign port to
Direct 1

Direct 1 has an orange
highlight. This shows
that it has been clicked
and is 'selected'.

- 7) You will see the interface port appear inside the direct box.
- 8) Repeat steps 5 and 6 to add a second port to the direct box, connecting the ports within it.
- 9) To unassign the port from the direct connection click '-' within the direct box icon.



Click '-' to remove port from **Direct 1**

Note: A 4-Wire Direct must be selected before ports can be assigned to it.

Note: A 4-Wire Direct cannot be assigned to a route twice so it must be unassigned from a direct box as necessary before assignment.

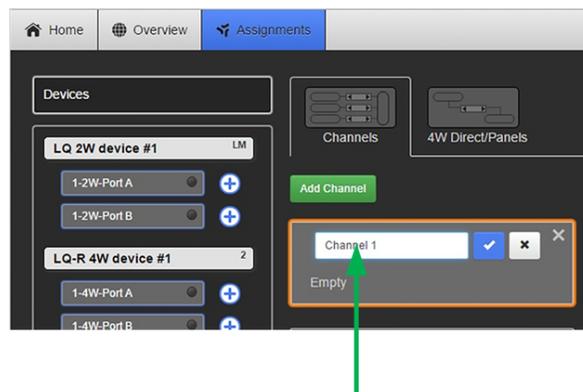
11.2.1 Port availability status

Port assignment status is represented by the following three colors:

- White: connected, audio is being transmitted
- Yellow: connection pending, connection status unknown
- Red: device is unreachable
- If one of the devices is displaying three yellow dots, the connection is pending.

11.3 Modifying a channel/4-wire direct label

Clicking on a blue channel/4-wire direct header will allow you to change the name of the channel or direct. Enter the new channel/direct name and press <ENTER> key or click the blue check mark to apply changes.



Click on label and enter channel (or 4-wire direct) name. Click on blue check mark or <ENTER> key to submit.

Figure 11-3 Modifying a channel/direct label

11.4 Example audio assignment via a Pico matrix

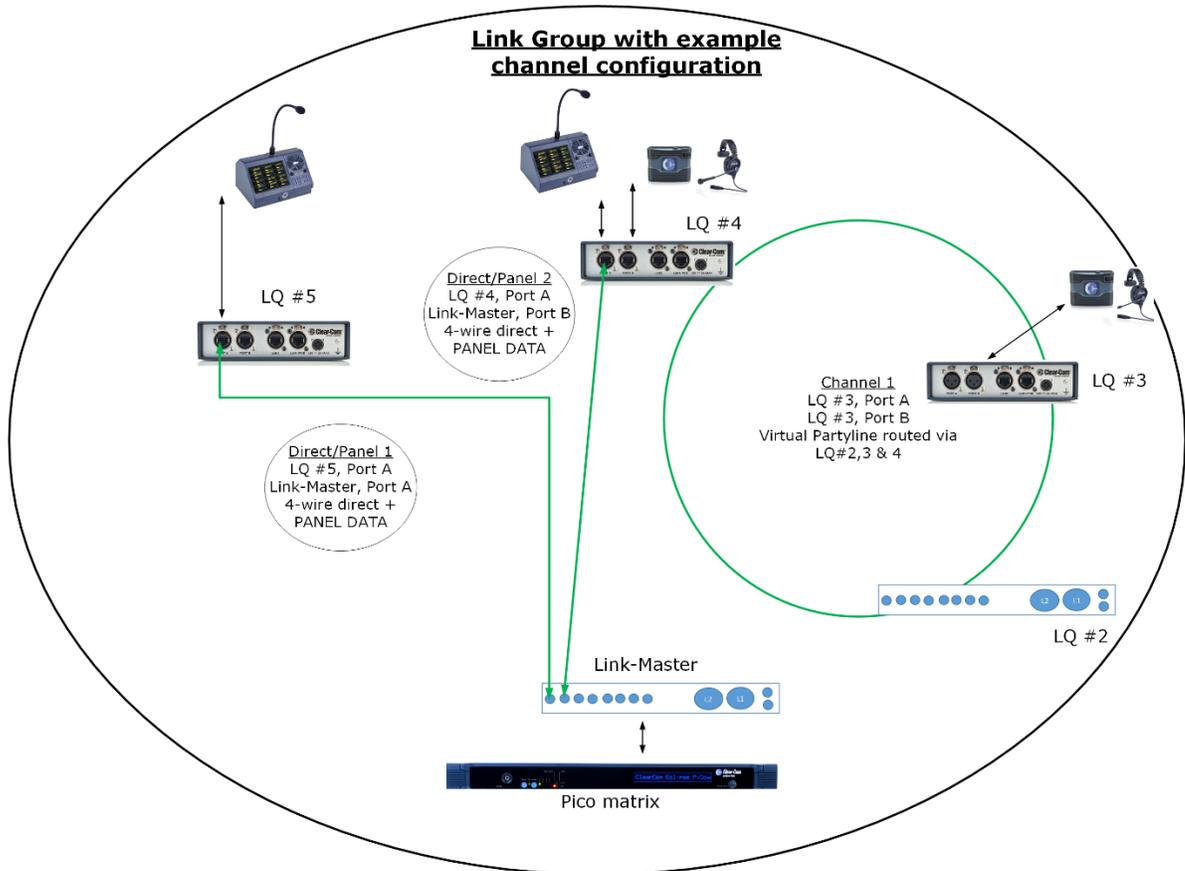


Figure 11-4 Example audio assignment

Note: A 4-wire direct connection is between two points. A channel can accommodate many audio routes in a partyline.

12 Using LQ™ to interconnect equipment

When connecting LQ units to other Clear-Com products and third party intercom systems please use the following guidelines:

Device type	Which LQ unit?	Port Function	Supports call signaling?	Panel data?
HelixNet HLI-4W2	LQ-4W2 LQ-R4W8 LQ-R2W4-4W4	To panel	Yes	No
HelixNet HLI-2W2 (Note: this connection is not preferred for optimum audio quality)	LQ-2W2 LQ-R2W4 LQ-R2W4-4W4	N/A	Yes	No
MVX-A16/Eclipse Pico	LQ-4W2 LQ-R4W8 LQ-R2W4-4W4	To matrix (Identified as a CCI-22 see 12.3 below.)	Yes	Yes
Other matrices (3 rd party)	LQ-4W2 LQ-R4W8 LQ-R2W4-4W4	To panel	No	No
Encore MS-702/4	LQ-2W2 LQ-R2W4 LQ-R2W4-4W4	N/A	Yes	No
Encore RS Beltpack 1/2/3	LQ-2W2 LQ-R2W4 LQ-R2W4-4W4	N/A	Yes	No

Device type	Which LQ unit?	Port Function	Supports call signaling?	Panel data?
RTS 2-wire equipment	LQ-2W2 LQ-R2W4 LQ-R2W4-4W4	N/A	Yes, but does not pass call signaling to 4-wire audio routes.	No
HME DX210	LQ-4W2 LQ-R4W8 LQ-R2W4-4W4 LQ-2W2* LQ-R2W4*	To panel N/A	Yes	No
Tempest 2400	LQ-4W2 LQ-R4W8 LQ-R2W4-4W4 LQ-2W2* LQ-R2W4*	To panel N/A	Yes	No
FreeSpeak	LQ-4W2 LQ-R4W8 LQ-R2W4-4W4 LQ-2W2* LQ-R2W4*	To panel N/A	Yes**	No
V-Series panel i-Series panel	LQ-4W2 LQ-R4W8 LQ-R2W4-4W4	To panel	Yes	Yes

- *This connection is **not** preferred for optimum audio quality. LQ-4W2 is recommended.
- ** On a FreeSpeak Base station, **only** ports 3 and 4 pass call signaling.

Table 1 Interconnection guidelines

12.1 Connecting 2-wire equipment

When connecting 2-wire equipment the following functions should be taken into consideration:

- Auto-null
- **Note:** Every time equipment is changed on a 2-wire port you should auto-null.
- Enable/Disable the partyline power
- Line Termination.

These functions can be found in the 2-wire port settings page of the CCM. Navigate to **Device > A/B** on any unit in the Link-Group and click '+' to expand options.

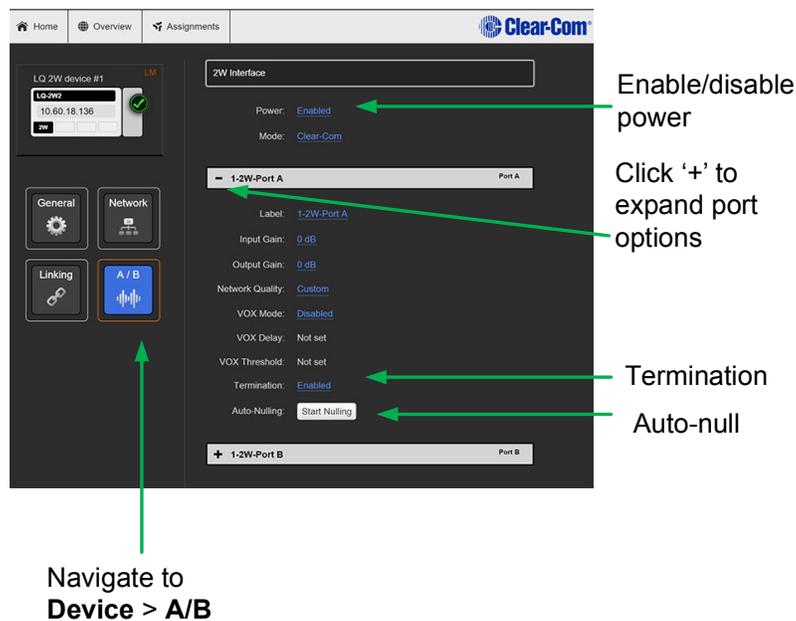


Figure 12-1 2-wire port options

Equipment	Port settings
Encore RS beltpack 701/2/3	Power: Enabled Termination: Enabled Auto-nulling: Start auto-nulling
Encore MS-702/4 Encore PK-7 Encore PS-702/4	Power: Disabled Termination: Disabled Auto-nulling: Start auto-nulling

Table 2 Interconnectivity port settings guidelines

12.2 Connecting to 4-wire equipment

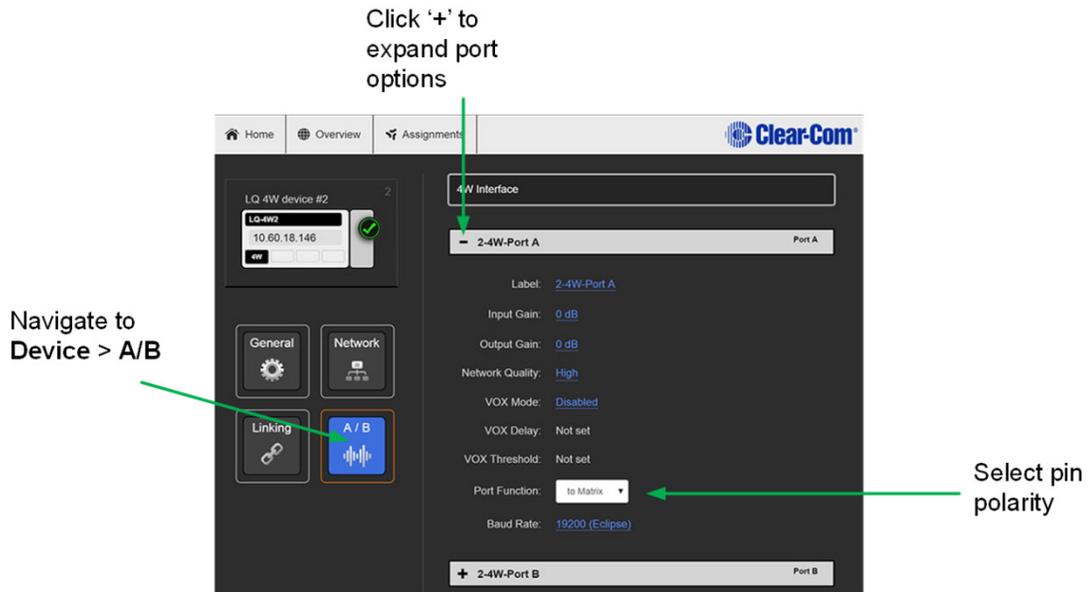
Note: To minimize noise, use screened (shielded) cable when connecting 4-wire ports.

12.2.1.1 Pin-out configuration

Pin-out configuration can be set on all LQ Series 4-wire interfaces. This is a software switch that switches the configuration of the pins on the RJ45 etherCON connectors, according to the device you are connecting to. See **Table 1** above.

Pin-out configuration is set 'to Matrix' by default. To set the pin configuration of a device:

- 1) Access the CCM for any unit in the Link-Group.
- 2) Navigate to **Device > A/B** and click '+' to expand options.
- 3) Select either 'to Matrix' or 'to Panel' and either press the <ENTER> key or click the blue check mark to submit changes.



12.3 Connecting an Eclipse Pico or MVX card to an Encore device using LQ

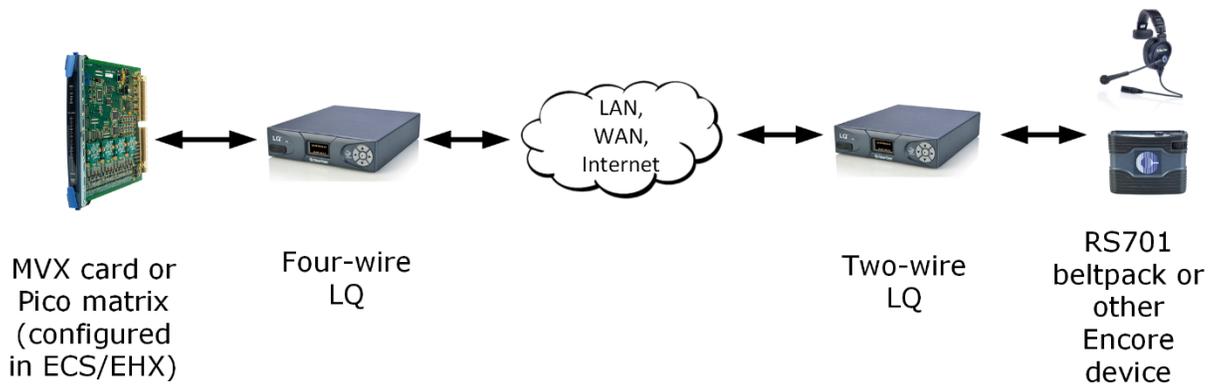


Figure 12-2 Connecting an Encore device to a matrix over IP

When setting up this connection, care must be taken to configure the port in the EHX software correctly. This is because, in this case, the port must be declared as a CCI-22 device as the port detection device on the LQ will recognise it as such.

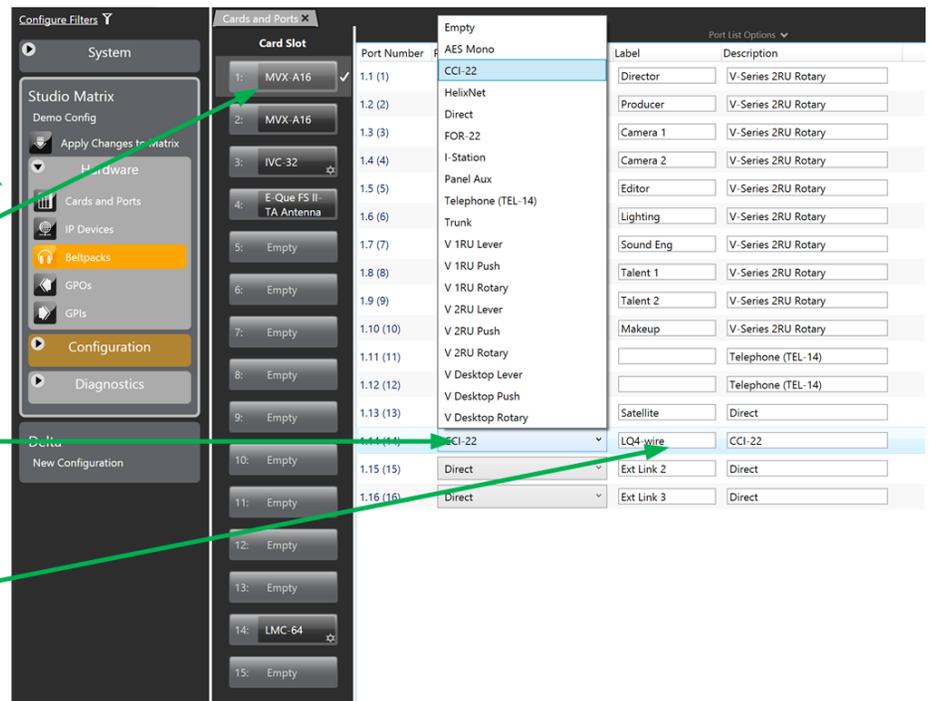
- 1) From the EHX software, navigate to **EHX/System/Cards and Ports**.
- 2) Select the MVX card port.
- 3) Select a CCI-22 device from the list.
- 4) It is advisable to label the port as an LQ 4-wire device to avoid confusion.

1. Navigate to EHX/Hardware/Cards and Ports

2. Select MVX card

3. Set port as CCI-22

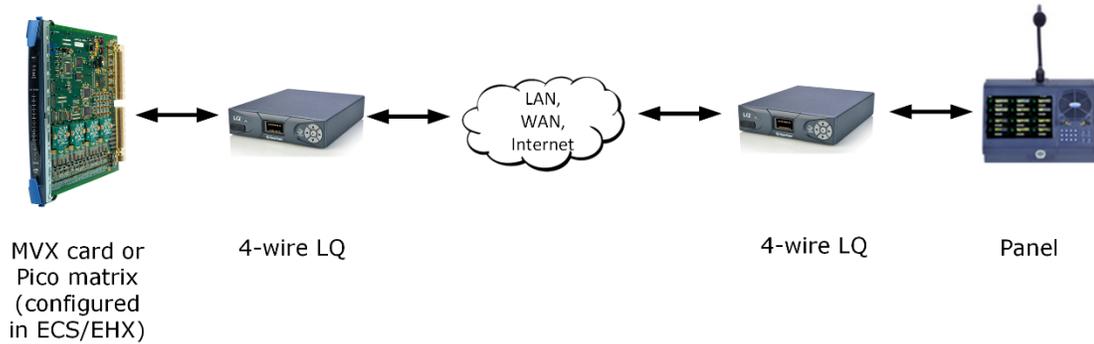
4. Label port as LQ 4-wire



Note: The connection between the MVX or Pico and the LQ device is a 4-wire connection, even though it is declared as a 2-wire connection.

See **5.16 Port Function** in the *Eclipse 8.5.1 EHX Software User Guide* for more information on port function.

12.4 Connecting an Eclipse Pico or MVX card to a panel using LQ



When setting up this connection, the MVX port to the LQ should be declared as a panel in the EHX software.

See **5.16 Port Function** in the *Eclipse 8.5.1 EHX Software User Guide* for more information on port function.

12.4.1 Setting pin configuration 4-wire ports

See **15 Technical specifications** for pin-outs.

13 Upgrading your device

Upgrades for your device will be available from the Clear-Com website.

<http://www.clearcom.com>

In order to upgrade your device, you will need to import the upgrade file provided by Clear-Com into the device via the unit's CCM (Core Configuration Manager). An LQ unit must be upgraded from the host device (the device that the browser is currently addressing). The units cannot be upgraded by proxy.

Note: All devices in a Link-Group MUST be running the same version of the software.

13.1.1 Import the upgrade file

- 1) Open a browser window and input the IP address of the device into the URL field to access the CCM. The device IP can be found on the front display of the unit when it is powered and booted.
- 2) Navigate to **Home** > **General** in the CCM.
- 3) Expand the **Upgrade** option (click on '+').
- 4) Click **Select File** and navigate to the upgrade file (.gz extension). Select the upgrade file to upload it.
- 5) When the upgrade file is loaded, **Upgrade** will light up. When this happens, click on it to upgrade. When the upgrade is finished, the unit will reboot by itself.

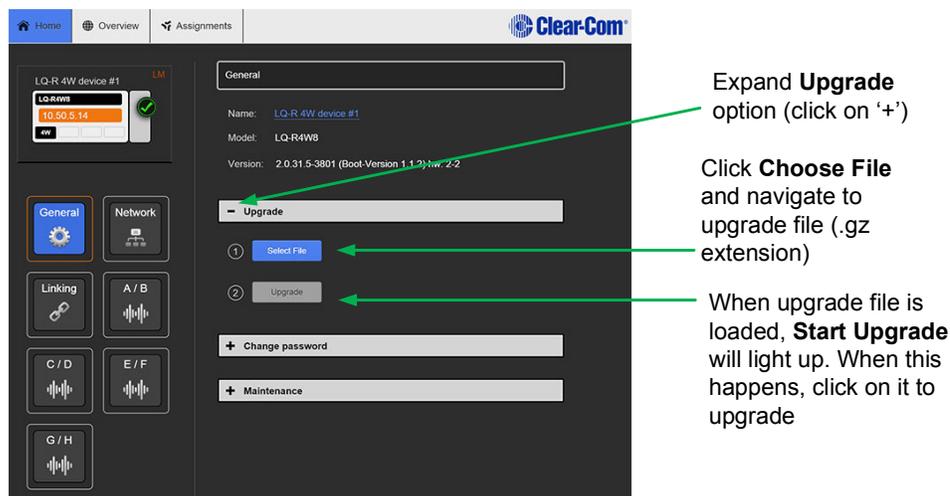


Figure 13-1 Upgrade your device

Note: If you downgrade an LQ unit from Version 2 to Version 1, you will see a red light flashing on the front panel after the first reboot. Power cycle the unit one more time to reset the status.

14 FAQs

14.1 How can I find the IP address or name of my LQ unit?

The name and IP address of an LQ device can be found on the front panel display of the units and also in the Web GUI. The IP address and name of a unit can only be changed via the CCM (Web-based Core Configuration Manager).

14.2 What does a solid red light on the front panel keypad indicate?

A solid red light on the keypad shows that the unit has lost its IP connection to the Link-Master.

- 1) Make sure that the Link-Master's IP address is reachable from the network point where the Link-Member is connected.

14.3 What does a flashing red light on the front panel keypad indicate?

A flashing red light shows that there is an ID conflict within the LQ-Group, meaning that two LQ units are trying to connect to a Link-Group using the same link ID.

To resolve this you will need to undo the unit's link to the Link-Master and then re-apply the linking process to an available ID:

- 1) Within a Web browser, enter the IP address of the LQ device which is showing the flashing red LED. This takes you to the Core Configuration Manager (CCM) for that unit.
- 2) Navigate to the device's **Linking** page (**Home > Linking**).
- 3) Click the **Change Role to Link-Master** button and click **Apply Changes**.
- 4) Now reconfigure the link and the link ID. To do this, click the **Change Role to Link-Member** button, and enter the Link-Master IP. Click the blue check mark or <Enter>.
- 5) Select an available ID slot (available IDs will be highlighted in blue) and click **Apply Changes**.

14.4 What does a persistent flashing green light (more than 2 minutes) on the front panel keypad indicate?

The devices boot automatically when power is supplied and show a flashing green light on the front panel keypad while the system is booting.

If the device is booting (the flashing green light does not turn into a solid green light) for more than 2 minutes, and the display screen does not move beyond the Clear-Com splash screen, the most likely explanation is that the unit does not have enough power. This can happen if too many LQ devices are drawing power from the same PoE switch or network.

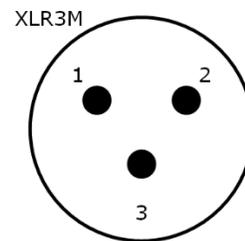
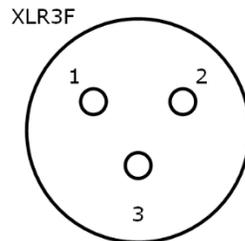
Please check the power supply provided by PoE to see if this is the case and consider using the supplied power connector cable to power the devices.

14.5 What types of 2-wire intercom do LQ Series units support?

- Clear-Com

Clear-Com 2-wire
XLR pin-out

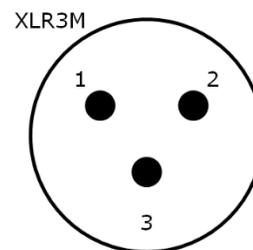
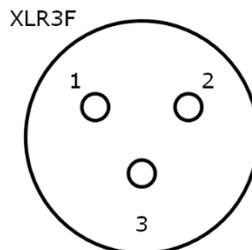
1. Ground
2. DC power (30V)
3. Duplex audio



- RTS TW

RTS TW 2-wire
XLR pin-out

1. Ground
2. DC power (30V)
Duplex audio 1
3. Duplex audio 2



14.6 Can I connect Clear-Com intercom panels to LQ 4-wire devices?

Yes, Version 2 firmware and later supports Clear-Com Eclipse ECS/EHX matrix to panel connections.

Matrix+3 connections are not supported.

14.7 How are LQ Series devices powered?

- LQ throw-down units use local power (24 watt sleeve-locking PSU) or Power over Ethernet (PoE).
- LQ-R 1RU rack units use local power only (2 x 60 watt sleeve-locking PSUs).

14.8 How do I update the software in the LQ units?

Connect a Web browser to the LQ unit and navigate to the **Upgrade** section within the device configuration page (**Home > General**).

For more detailed information see **13 Upgrading your device**.

14.9 How do I eliminate choppy audio being received by another LQ unit?

Choppy audio is usually the result of a port that has a Network Quality setting that is too high for the IP network. The following two approaches will help resolve this issue:

14.9.1 Reduce the Network Quality setting on the transmitting LQ unit's port

- 1) Within a Web browser, enter the IP address of the LQ device which is transmitting the audio to the receiving unit. This takes you to the Core Configuration Manager (CCM) for that unit.
- 2) Navigate to the LQ unit's audio interface configuration page (**Home > 2-Wire/4-Wire**).
- 3) Click on the **Network Quality** setting for the appropriate port.
- 4) Choose a lower network quality setting and click on the check mark to apply the setting.
- 5) Repeat step 4 until the choppy audio is minimized.

14.9.2 Reduce the Network Quality setting on the receiving LQ unit's port

To modify network quality on the receiving LQ unit's port use the following steps:

- 1) Within a Web browser, enter the IP address of the LQ device which is experiencing choppy audio. This takes you to the Core Configuration Manager (CCM) for that unit.

- 2) Navigate to the unit's audio interface configuration page (**Home > 2-Wire/4-Wire**).
- 3) Click on **Network Quality** for the appropriate port.
- 4) Choose a lower Network Quality setting and click on the blue check mark to apply the setting.
- 5) Repeat step 4 until the choppy audio is minimized.

Note: The jitter buffer setting is designed to buffer audio received to prevent loss if there is network jitter. Please be aware that the jitter buffer selection will directly affect the latency. This is because the lower number in the jitter range represents the amount of time the LQ unit will buffer audio before delivering it to the port. A bigger jitter buffer setting will increase latency in milliseconds.

The **Custom** option within the **Network Quality** setting allows adjustment of the jitter buffer setting independent of other settings.

14.10 How do I set the system up if I have to cross one or more firewalls?

As a minimum requirement for connectivity, the Link-Master must be reachable by all other Link-Members in the Link-Group. To achieve this, port-forwarding rules need to be created within the firewall which the Link-Master is behind. The ports that need to be forwarded are as follows:

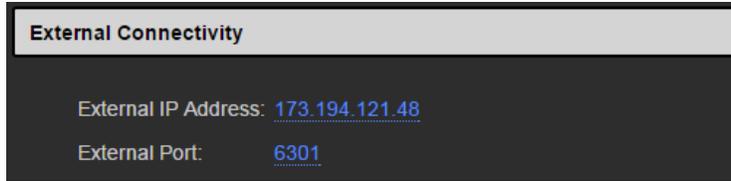
- 1) **80:TCP**. This is used for both link initiation and Web management.
- 2) **655:TCP/UDP**. This is used for the transmission of all audio and data (call signaling) between Link-Group members.

To set up a Link-Group with devices behind one or more firewalls, please observe the following **example** configuration:

Assume the following IP addresses and port-forwarding rules:

- **173.194.121.48** (external IP address)
 - **192.168.1.100** (Link-Master network address)
 - **6300** (arbitrary port chosen for port 80, the management port-forward rule)
 - **6301** (arbitrary port chosen for port 655, the audio/data port-forwarding rule)
- 1) Within the firewall, create a port-forward rule that forwards any **TCP** requests received on **173.194.121.48:6300** to **192.168.1.100:80**.

- 2) Within the firewall, create a port-forward rule that forwards any **TCP/UDP** requests received on **173.194.121.48:6301** to **192.168.1.100:655**.
- 3) Within the Link-Master's **Network** configuration page, configure the external IP and audio/data port:



- 4) Within the remote unit's **Linking** configuration page, configure the Link-Master's external IP and management port:



- 5) Repeat step 4 for each LQ unit to be part of the group.
- 6) For every Link-Member within the Link-Group that can be made externally reachable, navigate to the device's **Network** configuration page and configure the external IP and audio/data port as in step 3 (optional).

These configuration steps will ensure basic connectivity within the Link-Group. For more detailed information see **7 Internet connectivity**.

14.11 Why does the Link-Master need to have a static IP address?

The Link-Master needs to be statically addressed in order to prevent its IP address from changing. A changed IP address will result in loss of connectivity with the rest of the Link-Group.

Note: Another alternative is to maintain DHCP addressing but use the Address Reservation feature available in most managed routers. This will instruct the router to allocate a specific DHCP address to an LQ device identified by its MAC address. The unit's MAC address can be retrieved through the LQ's front panel menu.

14.12 What are the consequences if connection to the Link-Master is lost?

- Loss of audio. When connecting over the Internet, it is usually the case that the Link-Master is the only device that is reachable by the other units in the group. If this is the case, all audio will be routed through the Link-Master, creating the possibility of a single point of failure. To prevent this, be sure to facilitate connectivity between the LQ units in the group through port-forwarding, described in **7 Internet connectivity**.

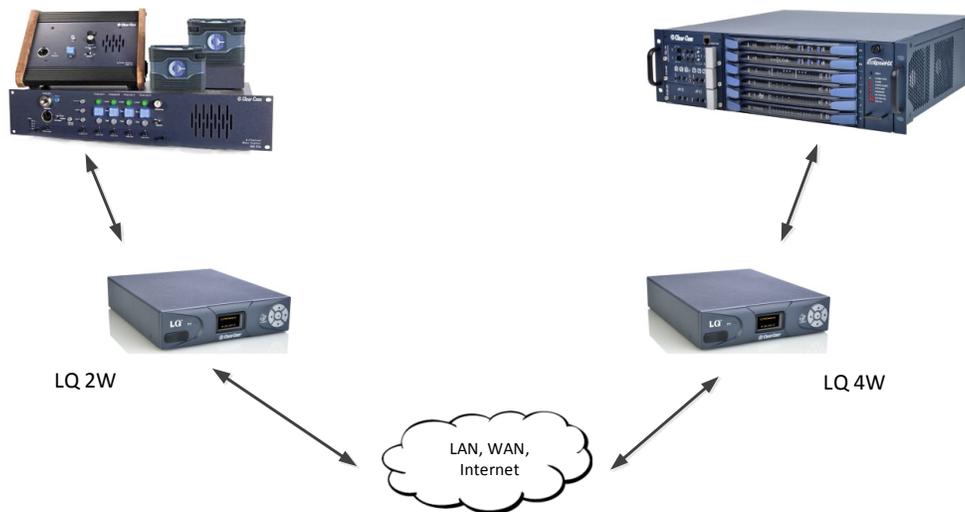
- Prevents the ability of any of the LQ units to modify the name of any of the static channel names.
- Prevents the distribution of device configuration changes throughout the Link-Group resulting in the possibility of having an inconsistent view of that configuration information depending on the perspective from which the device information is retrieved.

14.13 Does the LQ-4W2 pass call signaling?

Yes, but only call signaling originating from Clear-Com equipment. Call signalling to RTS equipment will be limited.

14.14 Can I link LQ-2W to an LQ-4W?

Yes, a 2-wire device can be linked to a 4-wire device.



14.15 Connectivity, including Web access to my LQ unit is intermittent, even though I am accessing it from within the same LAN.

The most probable cause for this is that an IP conflict exists. In this case, the IP address used by the LQ unit is already in use by another device within your LAN. The quickest and easiest way to check if this is the problem is to change the LQ unit's IP address to an address that is known to be available and observe if connectivity to the unit is once again consistent.

15 Technical specifications

15.1.1 Audio

Audio			
2-wire LQ		4-wire LQ	
Frequency response	50-10 kHz	Frequency response	100-12 kHz
Codec	OPUS	Codec	OPUS
Input/output gain	-3 to +3 dB	Input/output gain	-12 to +12 dB
Maximum input Clear-Com	0dBu (nominal -18dBu)	Input impedance	100K transformer isolated
Maximum input RTS	+6dBu (nominal -12 dBu)	Output impedance	120R transformer isolated
Termination	200R selectable	Maximum output	+18dBu (nominal 0dBu)
On-Noise	<-70dBu	Noise	<-75dBu
Off-Noise	<-85dBu		
Call drive voltage Call sense voltage Clear-Com	>11V <4V	Call drive and sense	Clear-Com
Call drive voltage Call sense voltage RTS	-7dBu 20kHz -32dBu 20kHz		
RMK (Remote microphone kill)	Clear-Com and RTS		

15.1.2 Pin-outs 2-wire

Pin	Clear-Com	RTS
Pin 1	Ground	Ground
Pin 2	DC power (30V)	DC power (30V) Duplex audio 1
Pin 3	Duplex audio	Duplex audio 2

15.1.3 Pin-outs 4-wire

Pin	To panel	To matrix
Pin 1	RS-422 input + (into matrix)	RS-422 output + (from panel)
Pin 2	RS-422 input - (into matrix)	RS-422 output - (from panel)
Pin 3	Audio input + (into matrix)	Audio output + (from panel)
Pin 4	Audio output + (from matrix)	Audio input + (into panel)
Pin 5	Audio output - (from matrix)	Audio input - (into panel)
Pin 6	Audio input - (into matrix)	Audio output - (from panel)
Pin 7	RS-422 output + (from matrix)	RS-422 input + (into panel)
Pin 8	RS-422 output - (from matrix)	RS-422 input - (into panel)

15.1.4 Partyline output current (2-wire)

Line voltage (selectable)	
LQ: PoE	26V 70mA max
LQ: DC power connector (12V PSU)	26V 150mA max
LQ-R: DC power connector (12V PSU)	26V 250mA max

15.1.5 Network quality settings

Note: Default option is in bold.

Bitrates	16, 32, 48, 64 , 128 kbps
Packet size	5, 10 , 20, 40ms, 60ms
Jitter buffer	200 - 1000ms, 100 - 500ms 60 - 200ms, 40 - 100ms, 20 - 60ms, 5 - 60ms , 0 - 60ms

15.1.6 Connectors

LQ Throw Down Units	
2-wire (LQ-2W2)	4-wire (LQ-4W2)
2 x etherCON (F) : network 2 x 3 pin XLR-F: audio	4 x etherCON (F): 2 for network, 2 for audio

LQ Rack Units		
2-wire (LQ-R2W4)	4-wire (LQ-R4W8)	Combined (LQ-R2W4-4W4)
2 x etherCON (F) : network 4 x 3 pin XLR-F 4 x 3 pin XLR-M	2 x etherCON (F) : network 8 x etherCON RJ45 F	2 x etherCON (F) : network 4 x etherCON RJ45 F 4 x 3-pin XLR-F

15.1.7 Power supply

LQ-R Rack Units	LQ Throw Down Unit
Input: 100-240V, 47-63Hz, 0.58A max Output: DC 12V, 2A, 60W max	Input: 100-240V, 47-63Hz, 0.58A max Output: DC 12V, 2A, 24W max
2 x Plug-in adapter with sleeve locking connector US,UK, Europe, AUS and China sockets included	1 x Plug-in adapter with sleeve locking connector US,UK, Europe, AUS and China sockets included

15.1.8 Environmental

Operating temperature	32 - 104°F (0 - 40°C)
Storage temperature	-67 - 158°F (-55 - 70°C)
Humidity	90% non-condensing

15.1.9 Dimensions and weight

	LQ Throw Down Unit	LQ-R Rack Unit
Dimensions	6.8w x1.79h x 8.45d inches (173 x 46 x 215 mm)	19w x1.79h x 8.8d inches (484 x 46 x 224 mm)
Weight	1.83lbs (.83kg)	4.29lbs (1.95kg)

16 Terminology/glossary

4-wire direct	A 4-wire connection is characterised by two pairs of twisted copper wire which transmit in opposite directions. A 4-wire circuit gives a full-duplex interface which is often used to connect to 3 rd party devices. When used with the LQ Series, a 4-wire direct connection (as opposed to a channel) provides point-to-point and panel connections over IP. The 4-wire direct interface will pass panel data as well as audio. 2-wire connections are inactive in the 4-wire direct tab of the Assignments page in the CCM and cannot be used in this context.
CCM	Core Configuration Manager. This is the Web-based configuration tool that each LQ device is supplied with. It can be accessed by entering the IP address of your device (shown on the device front panel) into the URL field of a Web browser.
Channel	In the context of the LQ product, a channel represents a virtual party or conference line. A channel comprises audio from audio interfaces on the devices (ports A & B and A-F) that have been assigned to that channel. Within a channel, all parties can hear and speak to each other.
Host device	The LQ device whose Web-based configuration tool (CCM) your browser is currently directed to.
Linking	The act of joining multiple LQ devices together in one group.
Link-Group	A set of devices linked together forming their own isolated network.
Link-Master	Role of a device within a Link-Group that provides central reachability within the group as well as ownership of both configuration and distribution of information.
Link-Member	Role of a device within a Link-Group that shares client privileges within the group.
Partyline	In a partyline, all the participants on the line are involved in the same conversation, they can hear and talk to all members. In some contexts a partyline is known as a conference line. Partylines can be 2-wire or 4-wire.

Proxy device	A device within a Link-Group that can be configured via the Web-based configuration tool (CCM) of another unit in the group.
Virtual partyline	A virtual partyline is a digital audio channel that is made up of several different audio sources. In terms of audio, a virtual partyline behaves in the same way as a partyline; all participants can hear and talk to each other.

17 Compliance

FCC notice

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communication. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Changes or modifications not expressly approved by Clear-Com, LLC, an HM Electronics, Inc. company could void the user's authority to operate this equipment.

Industry Canada Compliance Statement

This Class[A] digital device complies with Canadian ICES-003.

Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la class[*] est conforme à la norme NMB-003 du Canada.

Korean notice

A급 기기 (업무용 방송통신기자재)
이 기기는 업무용(A급)으로 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기
바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

LQ Series products comply with the following specifications:

EN55022 Emissions

EN55024 Immunity

Electromagnetic Compatibility Directive 2004/108/EC

Low Voltage Directive 2006/95/EC

IEC60950-1

Warning:

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Waste Electrical and Electronic Equipment (WEEE)

The European Union (EU) WEEE Directive (2002/96/EC) places an obligation on producers (manufacturers, distributors and/or retailers) to take-back electronic products at the end of their useful life. The WEEE Directive covers most Clear-Com products being sold into the EU as of August 13, 2005. Manufacturers, distributors and retailers are obliged to finance the costs of recovery from municipal collection points, reuse, and recycling of specified percentages per the WEEE requirements.

Instructions for Disposal of WEEE by Users in the European Union

The symbol shown below is on the product or on its packaging which indicates that this product was put on the market after August 13, 2005 and must not be disposed of with other waste. Instead, it is the user's responsibility to dispose of the user's waste equipment by handing it over to a designated collection point for the recycling of WEEE. The separate collection and recycling of waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local authority, your household waste disposal service or the seller from whom you purchased the product.



Figure 17-1: WEEE Symbol