FCDC3 FLOWIRE GUIDELINES FOR EXIGO

SYSTEM MANUAL

A100K11959

Contents

1 Introduction

1.1 Document Scope

This document aims to provide the recommended guidelines to using the Flowire Converter with the Exigo PA/GA system.

1.2 Product Information

Item No.	Item Name	Description
1008080310	FCDC3	Flowire Ethernet Converter – PoE Mode B

1.3 Publication Log

Revision	Date	Author	Status/Comments
1.0	5.3.2020	MR/HKL	Published
2.0	22.11.23	CV/AGK	Published

1.4 Related Documentation

Document No.	Documentation
A100K11707	Exigo Network Guidelines
A100K11957	Flowire Converter Quick Guide
A100K11958	Flowire Configuration Manual
A100K11960	Replacing Flowire Converter
A100K11460	Exigo Technical Manual

2 How to Use Flowire

2.1 General

The Flowire Converter, FCDC3, enable Ethernet to run on the same two wires as power, providing simpler cabling and opening up for longer cable hauls. The FCDC3 is also capable of powering Ethernet devices attached to it, such as IP PA panels with PoE Mode B, if the physical PoE on/off-switch is enabled. Flowire can be used to support redundant connections, such as a PA panel connected to both main switches in an AB system. This requires a one-to-one connection to each switch. Flowire also supports star configuration, meaning one-to-many. This configuration does not support redundancy.

Different Flowire clusters must have separate Network Management Keys (NMK) to avoid detrimental results from crosstalk. Flowire units meant to communicate with each other must use the same NMK. A cluster is here defined as all the Flowire units connected to one power supply.

Note: In a redundant system, make sure the primary link between rack A and rack B does not utilize Flowire.

2.2 Power

Flowire Converters operate on 24VDC or 48VDC.

- 48VDC is required to power IP PoE products, such as PA panels via the Ethernet port. Minimum voltage at remote Flowire unit to obtain PoE is 40VDC. Minimum voltage at EAPFX-1-V2 and EAPFX-6-V2 access panel is 18VDC. Minimum voltage to operate TFIX stations with external loudspeaker Is 30VDC

- 48VDC is recommended to power EAPFX-1-V2 and EAPFX-6-V2 access panels. 24VDC is required to power legacy Vingtor-Stentofon Ex panels: EAPFX-1 and EAPFX-6. These panels do not tolerate 48VDC.

FCDC3 with PoE enabled forwards power via the Ethernet port. If this is not required, disable the PoE-switch. Always remember to disable the PoE when connecting to the switch, to avoid forwarding power to the switch port.

2.3 Rapid Spanning Tree Protocol (RSTP)

Flowire can be used to connect redundant access panels. STP or RSTP is used in the switches and panels to prevent loops and other issues in the network. RSTP should be enabled to get the fastest response times if changes occur on the network.
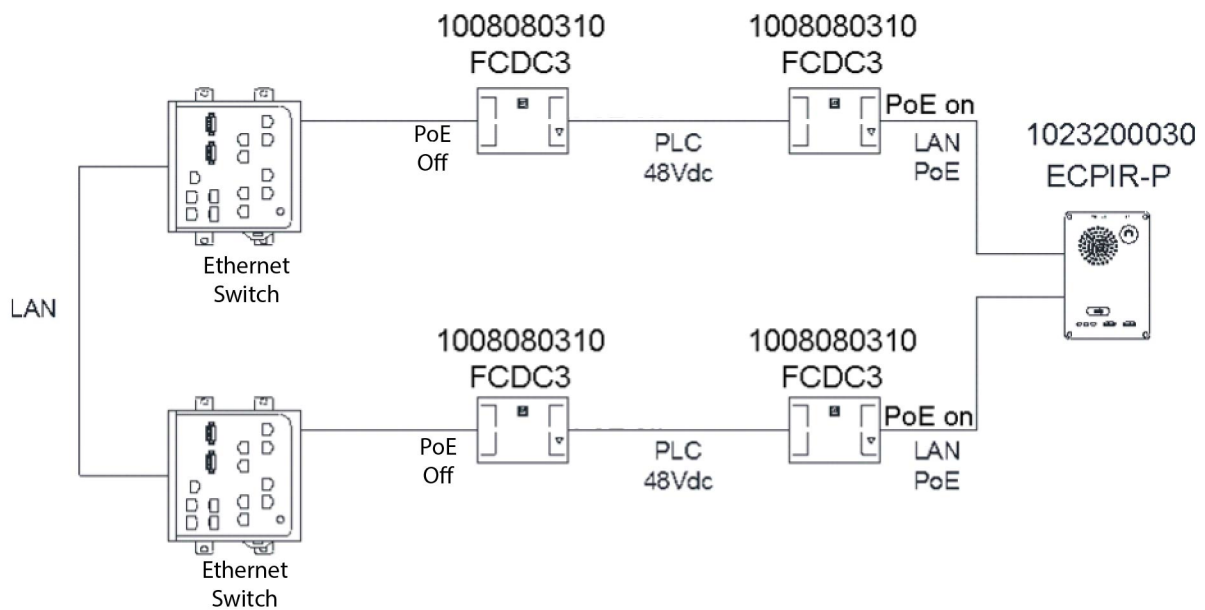
Figure 1: System with Network Loop - Network Storms Avoided with STP/RSTP

Under ideal conditions, a panel utilizing RSTP can switch from its main connection to its backup connection in 10 - 20 ms if the main connection is lost. If a panel does not have a redundant connection, RSTP should not be enabled on the panel.

Note that in a redundant system, a panel cannot serve as a link between system A and system B (switch-to-switch) if RSTP is enabled. Panels with RSTP enabled will not forward traffic from one Ethernet interface to the next.

Ex panels (EAPFX) do not have RSTP capabilities and will have longer switchover times than regular IP panels using RSTP.

After activating RSTP, connection to the panel must go through a switch. Direct connection from the PC to the panel will no longer work.

2.4 Flowire CCo

One of the Flowires in a cluster must be the **CCo** - **Central Coordinator**. CCo is essentially a bus master. By default, the Flowires automatically negotiate among themselves who is to be CCo.

By **cluster** we mean Flowires on a physical bus that share an NMK - Network Membership Key. If several NMKs are used, each "NMK-group" will be a cluster with its own CCo. (The HomePlug term for cluster is AVLN.)

But if there are more than two Flowires in a cluster, it can make a difference which Flowire is the CCo. If the CCo Flowire is lost, then the communication in the whole cluster will stop for several seconds until a new CCo is agreed upon. Therefore, it is best that a network-side Flowire is CCo, so that an endpoint-side Flowire out in the field can be lost without affecting the rest of the cluster.

For point-to-point link between two Flowires, it does not matter.

ⓘ *Note that if a cluster contains a mix of FCDC3 and legacy FCDC1 or FCDC2, then the FCDC3 should always be set to CCo.*

2.4.1 Configured PLC Role

There is a choice of three modes:

auto: Default - Negotiate who is to be CCo.

CCo: Force this Flowire to be CCo. Only one Flowire in the cluster can be forced to be CCo!

not CCo: This Flowire is never the CCo.

ⓘ *Note that if you select one of the Flowires as forced**CCo**, then all the others in the cluster must be set as* **not CCo***!*

Guideline

- Set endpoint-side Flowires as **not CCo**
- If there is only one Flowire in the cluster connecting to the network, set it as forced **CCo**
- If there are two redundant Flowires connecting to the network (using RSTP), leave them as **auto**

2.5 Wiring, Connection and Shielding with Flowire

Flowire uses a high frequency signal for data communication and could potentially interfere with other systems. To avoid this:

- Use a twisted, shielded pair for cabling.
- Separate the different pairs/cables/links as much as possible.
- The cable shield should only be connected to ground in one place, on the rack side.
- Redundant Flowire connections must be powered on separate electrical circuits.

3 Network Configuration

3.1 Switch Configuration

Always use managed switches for redundant Flowire connections (panels or other IP products connected to two Exigo systems for backup purposes).

Flowire units in redundant configurations need to be configured as a trunk on the switch, with native VLAN 1.

Where available, such as on advanced Cisco switches, storm control should be implemented to block rogue ports in a network storm if spanning-tree fails. The storm control will block the ports as soon as it reaches the configured threshold on the port and resume to forwarding states after it has returned back to below the safe level.

Cisco Switch configuration for trunk port:

- interface FastEthernet1/1
- description FLOWIRE LINK
- switchport mode trunk
- switchport nonegotiate
- spanning-tree guard loop (not for redundant systems using EX-stations)

Flowire units without a redundant link is treated as an end point and should be configured as an access port with portfast. When portfast is configured on the port it will always be in forwarding state.

Cisco Switch configuration for access port:

- interface FastEthernet1/2
- description FLOWIRE ACCESS PORT
- switchport mode access
- switchport nonegotiate
- spanning-tree portfast

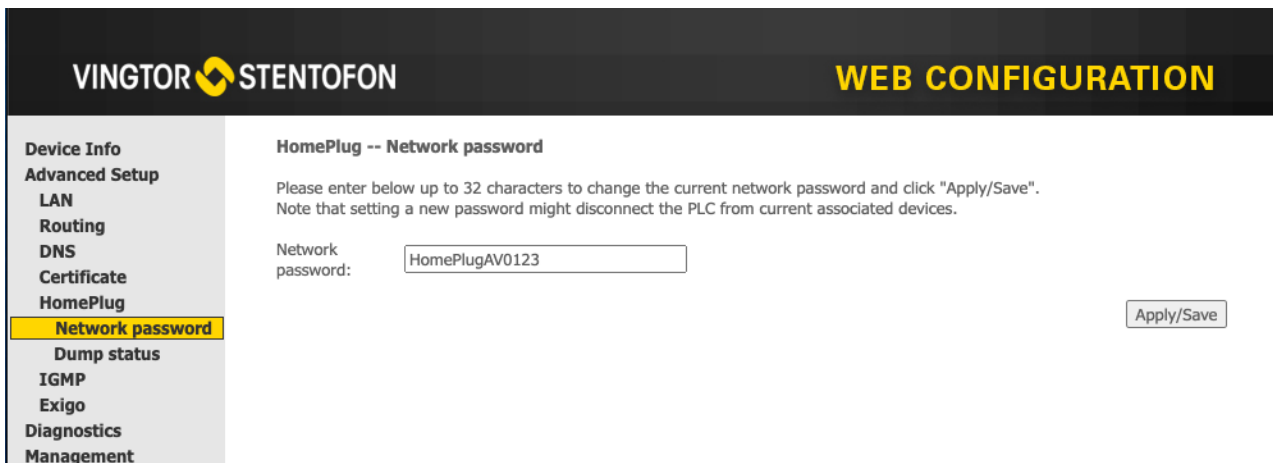## 3.2   Network Management Key (NMK) Configuration

The NMK is configured in the Flowire unit's web interface.

To set a new NMK password:

1. Log into the Flowire device by entering its IP address in a web browser.
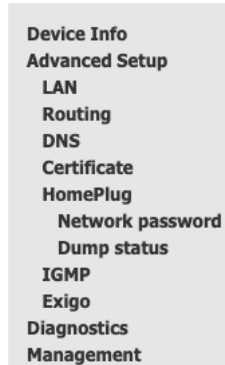
2. Select **Advanced Setup** > **HomePlug** > **Network password**

3. Enter a new password in the **Network password** field

4. Click **Apply/Save**

The NMK Password may be up to 32 characters long and is case sensitive.

It is good practice to label the Flowire device with the new NMK.

Default NMK: **HomePlugAV0123**

4 Flowire Configurations

4.1 One-to-One Connection

A one-to-one connection can be wired in 4 different ways in an Exigo system.

4.1.1 Option 1: Single Connection - 2 Flowire Units

When no redundancy is required, a single link using two Flowire units is used - one FCDC3 with PoE disabled in the rack, and one FCDC3 with PoE enabled at the panel end. If the single connection fails, communication with the panel will be lost. When using more than one Flowire connection (when supporting more than one panel via Flowire), each connection must utilize a separate NMK.

If it is not desired to power the panel via the Ethernet port, use FCDC3 with PoE disabled at the panel end and connect a power supply to the panel.
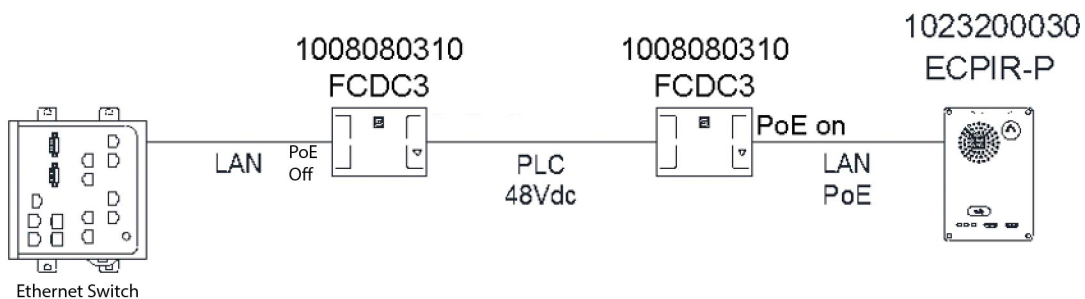

Figure 2: Single Connection - 2 Flowire Units

4.1.2 Option 2: Single Connection Ex Panel - 1 Flowire Unit

When no redundancy is required on an Ex-panel (EAPFX-1 or EAPFX-6), a single link using one FCDC3 with PoE disabled in the rack is sufficient. Ex panels have Flowire technology integrated on their main boards. If the single connection fails, communication with the panel will be lost.

When using more than one Flowire connection (when supporting more than one panel via Flowire), each connection must utilize a separate NMK.
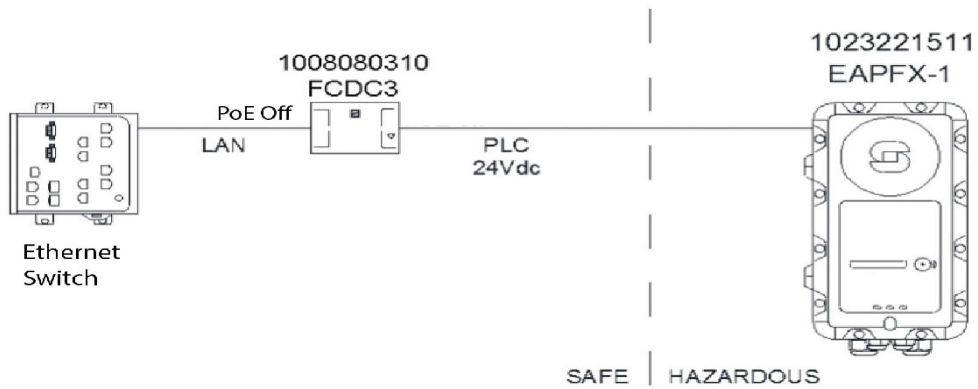
.

Figure 3: Single Connection Ex panel - 1 Flowire Unit

4.1.3   Option 3: Redundant Connections - 4 Flowire Units

When redundancy is required, use two Flowire links, one for system A and one for system B, consisting of two Flowire units each. One FCDC3 with PoE disabled in each rack is connected to one FCDC3 with PoE enabled each at the panel end. Each FCDC3 PoE enabled is connected to one Ethernet port on the panel.

If the system is configured correctly, one of the Flowire connections can be lost without losing communication with the panel. Switchover time will depend on whether the panel is configured to use RSTP or not.

Each connection should use a separate NMK and power supply, one for the A system and one for the B system.

When using more than one Flowire connection from each rack (when supporting more than one panel via Flowire), each connection must utilize a separate NMK and power supply.

If it is not desired to power the panel via the Ethernet port, use FCDC3 with PoE disabled at the panel end and connect a power supply to the panel.
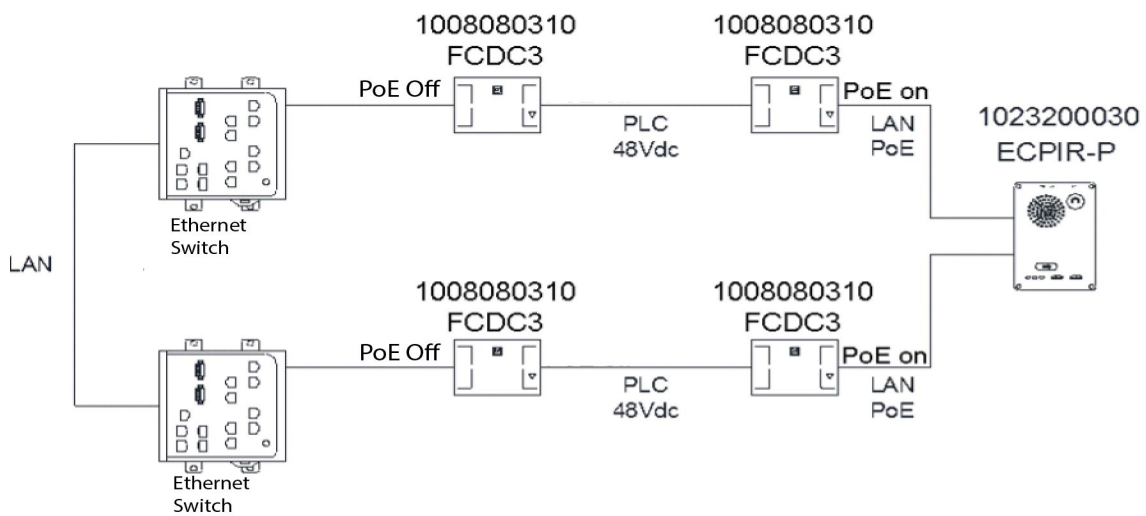

Figure 4: Redundant Connections - 4 Flowire Units

ⓘ *Note that the two Flowire units at the panel end could in theory be replaced by one Flowire unit. This is not recommended as each connection would be vulnerable to short circuiting on the other connection. It would, in practice, constitute a single connection between two systems, using only one NMK.*

4.1.4   Option 4: Redundant Connections Ex Panel - 2 Flowire Units

When redundancy is required on an Ex-panel (EAPFX-1 or EAPFX-6), two links using one FCDC3 with PoE enabled in each rack is sufficient. Ex panels have Flowire technology integrated on their main boards.

If the system is configured correctly, one of the Flowire connections can be lost without losing communication with the panel. Switchover time should be 7-10 seconds. RSTP is not supported on Ex panels.

The Flowire units in each rack and the Flowire unit in the Ex-panel must have the same NMK and power supply.

When using more than one Flowire connection from each rack (when supporting more than one panel via Flowire), each connection must utilize a separate NMK.
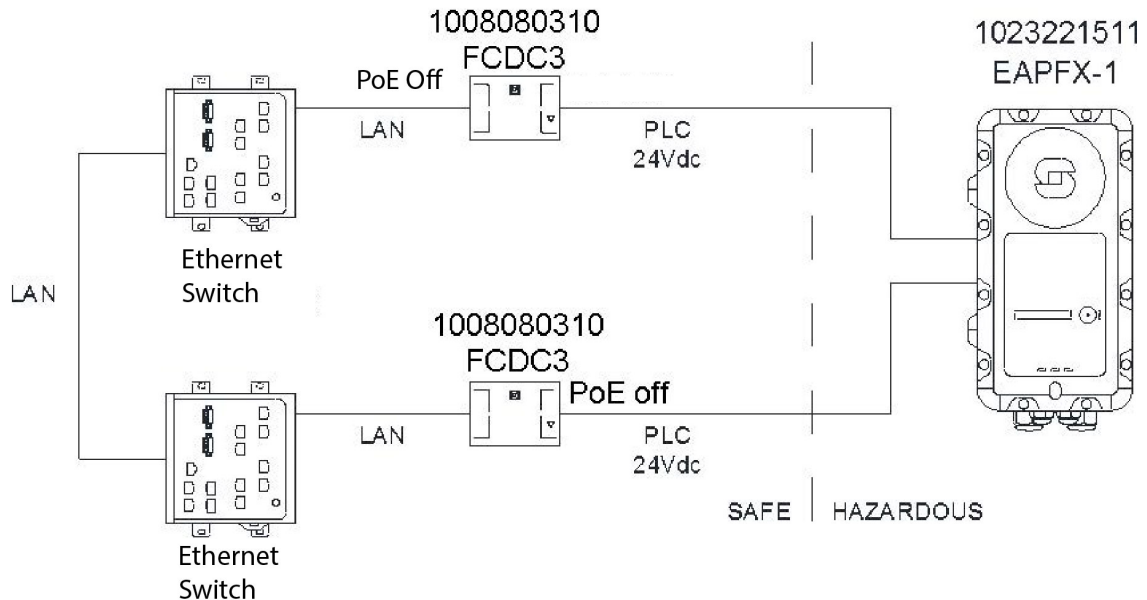

Figure 5: Redundant Connections Ex Panel - 2 Flowire Units

4.2   Star Configuration

In order to save space and/or reduce the number of Flowire units in a system, it is possible to connect up to 9 Flowire units in a "star configuration" where 1 Flowire unit in the rack is connected to the switch, and the other 8 are connected to this Flowire unit, usually via a patch panel
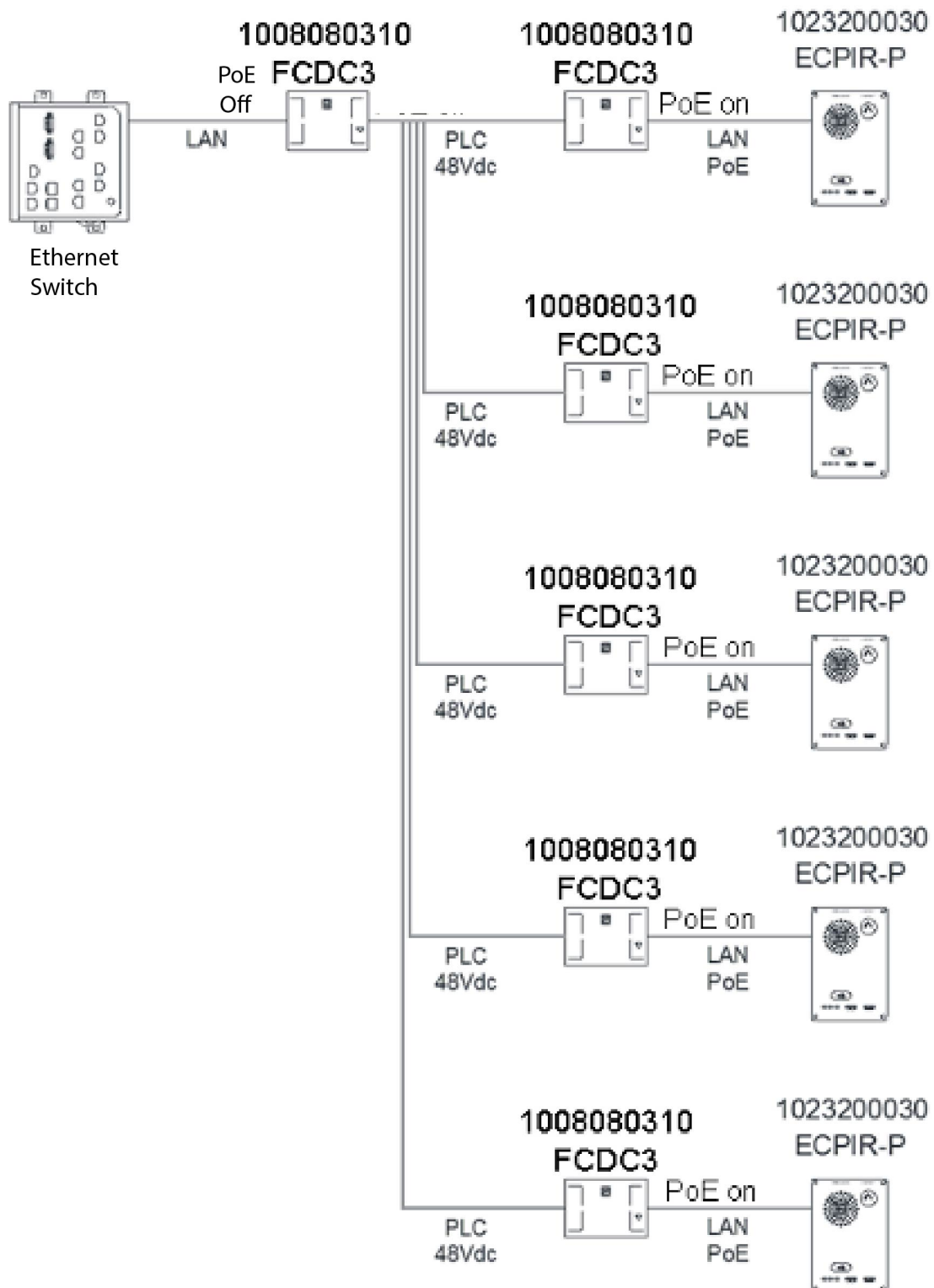
Figure 6: Flowire Star Configuration with 5 panels using 6 Flowire units to connect to the system via PLC

PLC = Power Line Communication

ⓘ *Note that the star configuration cannot be redundant. In an A-B system, one to one connection should be used for connecting the Flowire units.*

4.2.1 CCo Settings for Star Configuration
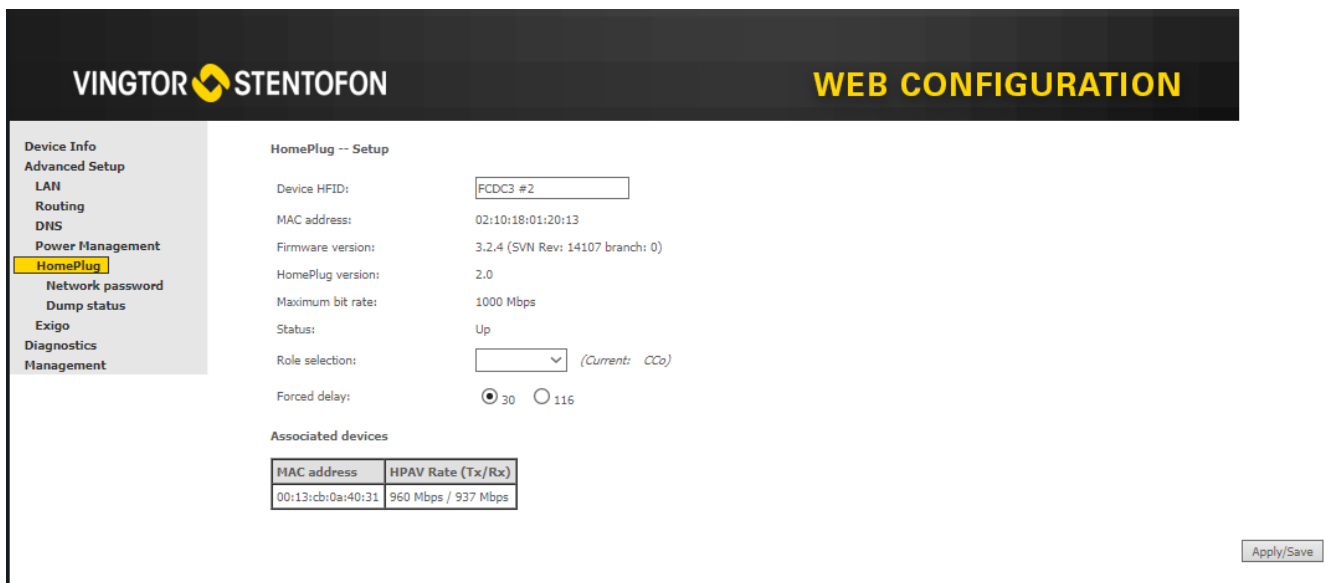
- Select **Advanced Setup** > **HomePlug**

Figure 7: Configured PLC Role - CCo, Not CCo, Auto

In the Flowire web interface, each Flowire unit has a setting for CCo (Central Coordinator). In every Flowire network, there is always one CCo, but this is, by default, automatically selected. If the CCo should fail, another Flowire unit on the network is automatically selected to be the CCo. In a star configuration, in order to optimize availability, it is recommended to always configure the FCDC3 in the rack to be CCo. Due to its location, it is least likely to suffer damage; and if this Flowire unit fails, the star configuration will not function in any case, whether or not it is the CCo, as all other Flowire units are routed through it. For the FCDC3 in the rack to be configured as a CCo, it is necessary to configure the device-side Flowire units to be **not CCo**.

ⓘ *Note that after changing CCo settings, the Flowire unit has to be rebooted.*

For more information, see the wiki page [Flowire CCo](#) on this subject.

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