DICENTIS

Conference System

en Hardware Installation Manual

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1   Safety

Prior to installing or operating products, always read the Important Safety Instructions which are available as a separate multilingual document: Important Safety Instructions (Safety_ML). These instructions are supplied together with all equipment that can be connected to the mains supply.

Safety precautions

Some of the DICENTIS Conference System products are designed to be connected to the public mains network.

To avoid any risk of electric shock, all interventions must be carried out with disconnected mains supply.

Interventions with the equipment switched on are authorized only when it is impossible to switch the equipment off. The operation must only be performed by qualified personnel.
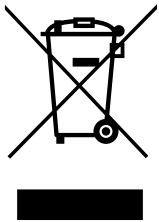
Old electrical and electronic appliances

Electrical or electronic devices that are no longer serviceable must be collected separately and sent for environmentally compatible recycling (in accordance with the European Waste Electrical and Electronic Equipment Directive).

To dispose of old electrical or electronic devices, you should use the return and collection systems put in place in the country concerned.

2   About this manual

The purpose of this manual is to provide information required for installing the DICENTIS Conference System.

This installation manual is available as a digital document in the Adobe portable document format (PDF).

For more information, refer to the product related information on www.boschsecurity.com

2.1   Intended audience

This hardware installation manual is intended for installers of a DICENTIS Conference System.

2.2   Alerts and notice signs

Four types of signs can be used in this manual. The type is closely related to the effect that may be caused if it is not observed. These signs - from least severe effect to most severe effect - are:

Notice!
Containing additional information. Usually, not observing a 'notice' does not result in damage to the equipment or personal injuries.

Caution!
The equipment or the property can be damaged, or persons can be lightly injured if the alert is not observed.

Warning!
The equipment or the property can be seriously damaged, or persons can be severely injured if the alert is not observed.

Danger!
Not observing the alert can lead to severe injuries or death.

2.3   Copyright and disclaimer

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The content and illustrations are subject to change without prior notice.

2.4   Document history

Release date	Documentation version	Reason
2013.08	V1.0	1st edition.
2014.07	V1.1	2nd edition. New sections: 1 WEEE, 3.2 system ext, 5.2.1, 5.2.2. Sections updated: 2.4, 4.3.2, 5.2, 5.3, 5.4, 7.2 + DCNM-MICx added.
2014.10	V1.2	3rd edition. Sections updated: 2.4, 3.2, 4.1 and 4.3.1.
2015.07	V1.3	4th edition. New section: 4.4, including sub-sections: 4.4.1, 4.4.2, and 4.4.3. Sections updated: 2.4, 3.1, 3.2, 4.1, 4.3, 4.3.1, 5.3, 5.4, 6.1, 7.4, 8.
2015.11	V1.31	5th edition. Sections updated: 2.4, 7.1. Terminology updated.
2016.07	V1.4	6th edition. Terminology updated. DCN multimedia changed to DICENTIS. Sections updated: 3.1, 3.2, 4.1, 4.3.1, 4.3.2, 4.4.1, 4.4.2, 4.4.3, 5.3, 5.4, 7.1, 7.2, 7.3, 7.4, 8.

3   System installation overview

It is advisable to participate in the DICENTIS Conference System training before you install, configure, prepare, and operate a DICENTIS Conference System.

The DICENTIS Conference System is an IP based conference system which runs on an OMNEO compatible Ethernet network. It is used for distributing and processing audio, video and data signals.

The DICENTIS Conference System can be quickly and easily configured as a daisy-chain configuration or as a star configuration:

– **Daisy-chain configuration**: Uses dedicated cabling, consisting of CAT-5e cables including two additional power conductors (see *Typical system setup, page 8*).
– **Star configuration**: Each DICENTIS device is connected with an individual standard CAT-5e cable. An Ethernet switch is also required for providing Power over Ethernet (PoE).

Notice!

When Power over Ethernet is used, DICENTIS devices cannot be daisy-chained.

See also
– *Typical system setup, page 8*

3.1   Typical system setup

Figure 3.1: Typical DICENTIS Conference System setup

A typical DICENTIS Conference System consists of:
1.   System server controller (PC):
     –   The heart of the system. It licenses functionality, configures and controls the system.
2.   Client PC:
     –   Can be used to: Manage meetings, prepare meetings and configure the system.
3.   Audio Powering Switch (DCNM-APS / DCNM-APS2):
     –   Controls the system audio, routes audio from and to the system and supplies power to the DICENTIS devices.
4.   Powering Switch (DCNM-PS / DCNM-PS2):
     –   Is used to increase the number of DICENTIS devices connected to the system.
5.   DICENTIS devices): DCNM-D, DCNM-DVT, DCNM-DSL, DCNM-DE / DCNM-MMD, DCNM-MMD2:
     –   Participants can use their DICENTIS device to contribute to a meeting.
     –   **5.1** is a DICENTIS multimedia Device used for "system power on/off". This device is always connected to the powered socket of the Audio Powering Switch or Powering Switch.
          Note: Only one DICENTIS multimedia Device should be connected here.
     –   **5.2** is a DICENTIS device used via a "Power over Ethernet" (PoE) Ethernet switch.
          Note: Only one DICENTIS device should be connected here.
6.   System Network Cable (DCNM-CBxxx):
     –   Connects DICENTIS devices, the Audio Powering Switch, and one or more Powering Switches to each other.
7.   Ethernet switch:
     –   Ethernet switch with PoE on some ports.
          - Routes the system data via Ethernet.
          - Provides power to the DICENTIS devices via PoE.
8.   CAT-5e Ethernet cable (minimum requirement).
9.   Optional HD Conference Dome (VCD-811-IWT) + external power supply:
     –   Captures the image of a speaking participant.

This system overview does not give information on redundant network options. For more information, refer to *Redundancy options, page 21*.

3.2   System extension

The DICENTIS Conference System is scalable from small to medium to large. This section describes what a small, medium and large system is and what the requirements are for these systems:

A small DICENTIS Conference System (see *Typical system setup, page 8*) consists of:
–   up to 100 DICENTIS devices.
–   all DICENTIS devices in 1 subnet.
–   1 DICENTIS Audio Powering Switch for the audio processing.
–   1 Server PC which hosts the DICENTIS services.

A medium DICENTIS Conference System consists of:
–   up to 450 DICENTIS nodes.
     Refer to table X about the node count of DICENTIS equipment.
–   all DICENTIS devices in 1 subnet.
–   1 DICENTIS Audio Powering Switch for the audio processing.
–   1 Server PC which hosts the DICENTIS services.
–   1 ARNI-Standard to increase the size of the system.

A large DICENTIS Conference System consists of:
–   up to 750 DICENTIS devices.
–   multiple subnets connected by use of a router/L3 switch.
     –   Each subnet can have up to 450 DICENTIS nodes.
          Refer to the following table for the node count of DICENTIS equipment.
     –   The first subnet has:
          - 1 DICENTIS Audio Powering Switch for the audio processing.
          - 1 Server PC which hosts the DICENTIS services.
          - 1 ARNI-Enterprise to increase the size of the system.
     –   All other subnets have 1 ARNI-Standard to increase the size of the system.
          Note: There is no DICENTIS Audio Powering Switch in the other subnets.

Device	Node count
DICENTIS server	0
DICENTIS meeting application	0
DICENTIS Audio Powering Switch	1
DICENTIS Powering Switch	1
DICENTIS multimedia device	2
DICENTIS discussion device	1
DICENTIS discussion device select language	1
DICENTIS discussion device voting	1
DICENTIS discussion device extended	1
ARNI-E OMNEO interface	0
ARNI-S OMNEO interface	0

Table 3.1: Nodes count of DICENTIS equipment

An ARNI (Audio Routed Network Interface) is used to increase the number of DICENTIS devices on a single subnet and to connect multiple DICENTIS system subnets. If more than one subnet is required, two types of an ARNI must be used.

– OMN-ARNIS (ARNI-S OMNEO interface): The ARNI-S is required for increasing the system size above 100 DICENTIS devices. It supports up to 450 DICENTIS nodes in its subnet. It also acts as a DHCP server in its subnet.

– OMN-ARNI-E (ARNI-E OMNEO interface): The ARNI-E is required for increasing the system size above 450 DICENTIS nodes. It supports up to 450 DICENTIS nodes in its subnet. It also acts as a DHCP server in its subnet. It can connect up to 40 subnets, each with an ARNI-S.

Defining subnets and subnet masks

A subnet is a logical, visible subdivision of an IP network. The number of DICENTIS devices that can be in the same subnet depends on the subnet mask.

A standard class C subnet (255.255.255 or /24) can contain 254 IP addresses. Some DICENTIS devices have 2 IP addresses. For this reason, Bosch advises to use 255.255.252.0 (or /22) as a subnet mask. This allows you to have 1018 IP addresses. The following table lists the number of IP address per DICENTIS device in a DICENTIS Conference System.

Device	IP addresses
DICENTIS server (optional Meeting Application)	1
Client PC running DICENTIS meeting application	1
DICENTIS Audio Powering Switch	1
DICENTIS Powering Switch	1
DICENTIS multimedia device	2
DICENTIS discussion device	1
DICENTIS discussion device select language	1
DICENTIS discussion device voting	1
DICENTIS discussion device extended	2
ARNI-Enterprise	1
ARNI-Standard	1
IP camera	1
SDI video switcher	1

Table 3.2: Nodes count of DICENTIS equipment

Maximum number of DICENTIS devices in a string:

– The max age timer should be set to 22 when RSTP is used for cable redundancy to prevent a defective cable or powering switch from influencing the system.

– Each time data hops from one switch to another, the age is increased by one. This timer can be reached or exceeded, because a daisy chain can be used to loop through the DICENTIS devices.

– This timer (or restriction) cannot be reached when there is no cable redundancy. This is because the power limitation will be reached before the max age restriction is reached.
– The timer can be reached when:
    – you use cable redundancy.
    – the system is incorrectly wired.

Multi subnet DICENTIS Conference System

The following figure illustrates a typical multi subnet DICENTIS Conference System with a total of 1200 DICENTIS devices.

– The system is divided over four (4) subnets, where two (2) subnets having a maximum of 400 DICENTIS devices and an OMN-ARNIS are connected.

– The system has one OMN-ARNIS installed in the first subnet with a maximum of 400 DICENTIS devices connected (Note that only one OMN-ARNIS is allowed within a multiple subnet DICENTIS Conference System).

– Subnet four (4): When using multiple subnets, make sure that all cameras needed to capture video of the seats are all connected to the same subnet.
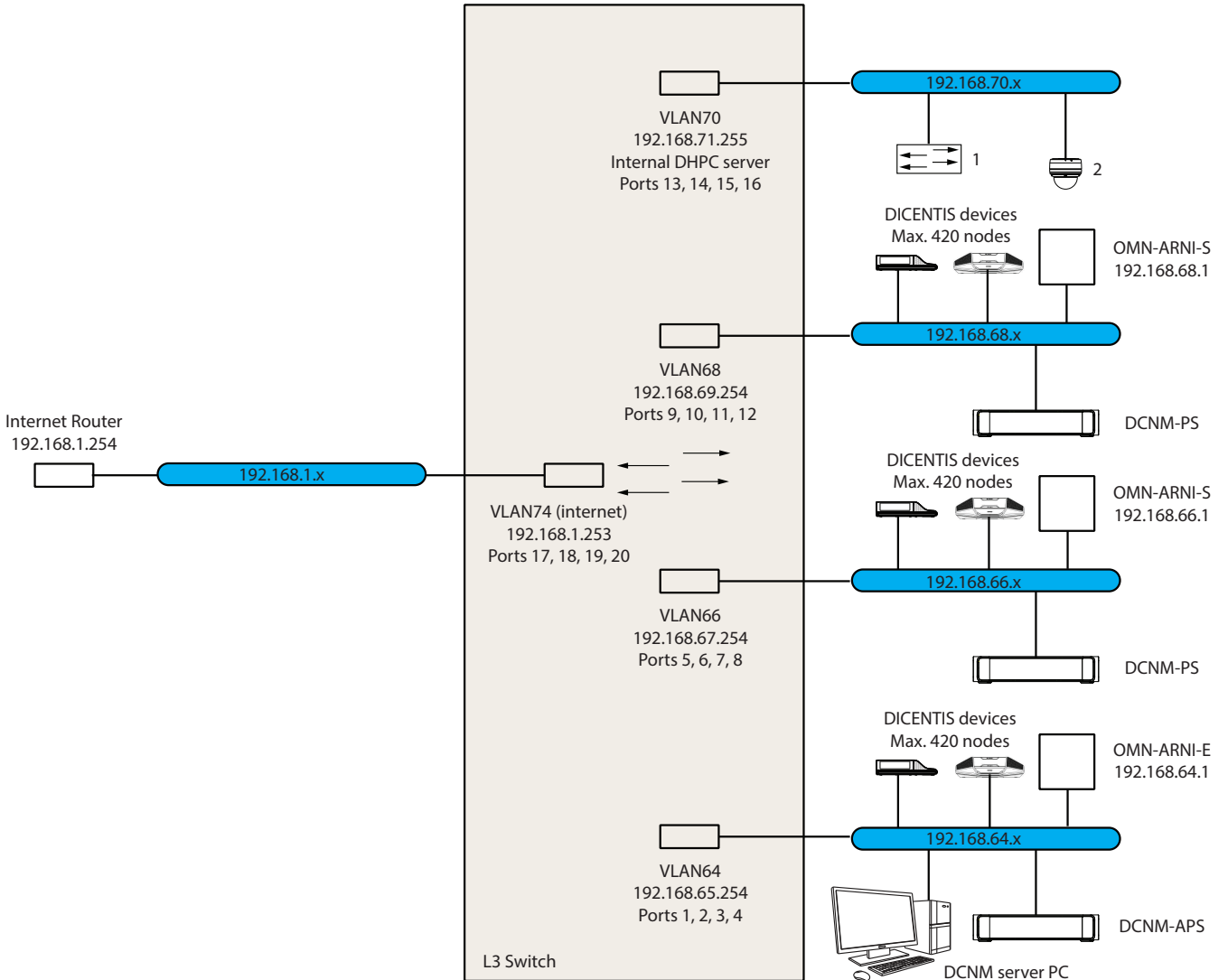
Figure 3.2: Typical DICENTIS Conference System with multiple subnets

– **1:** External video switcher.

– **2**: Dome camera.

4   System installation design and planning

Before you start to install system devices and connect system cabling, you should make a system design and planning:
–   Familiarize yourself with the product and system capabilities.
–   Make a cable (connection) plan:
    –   Calculate the system network cable length.
    –   Calculate the system power consumption.
    –   Calculate the required power capacity of the system.

> **Notice!**
>
> The DICENTIS Conference System uses the RSTP protocol when redundant cabling mode is enabled. If the DICENTIS Conference System needs to be connected with the locally present network, please consult the local IT department before continuing with the installation design.

> **Notice!**
>
> Make sure that the cable lengths and power consumptions do not exceed the specifications. Not doing so will result in malfunctioning at any moment of the DICENTIS Conference System and products.

4.1   System capabilities

The capability of the DICENTIS Conference System and DICENTIS products depends on:
–   The lengths of the system network cables.
–   The number of connected devices.
–   The system power supply capacity.
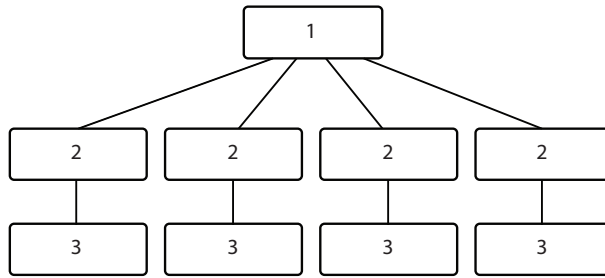
Cable length
System network cables (DCNM-CBxx) lengths (2, 5, 10 or 25 m) have a direct effect on the available power supply capacity. The longer the system network cable, the less power supply capacity is available to drive the connected devices. Therefore, choose the lengths of the system network cables carefully.

> **Notice!**
>
> Custom network cables must never exceed the maximum Ethernet specification of 100m (IEEE 802.3ab).
> Keep your network hierarchy as flat as possible. This means having as few levels as possible. It is recommended not to exceed 7 levels. See the following example: 1: 1st level = Root switch, 2: 2nd level = switch, 3: 3rd level = switch.

Figure 4.1: Example: Switch-levels

Power supply capacity

The total system network cable length and connected devices determine the required power supply capacity. The power within the DICENTIS Conference System is supplied by:
– The Audio Powering Switch and the Powering Switch, or
– Off-the-shelf PoE Ethernet switches.

Calculation tool

The calculation tool can be used to calculate the total power capacity of the system. This makes the design and planning of the DICENTIS Conference System easier. The calculation tool uses the power consumption of the devices and the system network cable lengths to calculate the needed system power supply capacity.

The calculation tool is on the DVD supplied with the Audio Powering Switch and is part of the DICENTIS software DCNM.iso file. The DCNM.iso file can be downloaded from the Bosch website at: https://licensing.boschsecurity.com/software

4.2   Hardware requirements

Switches

The following minimal requirements apply to switches:

– 1 Gbit or higher with hardware switching capabilities.
– Quality of Service through differentiated services with 4 or more output queues and strict priority packet scheduling.
– (Optional) IGMPv3 or IGMPv2 snooping. To optimize bandwidth usage, IGMP snooping can be used. This is useful in systems with >10 multicast streams, although not absolutely required. Sufficient performance for handling a large number of IGMP query responses, depending on the number of (directly or indirectly) connected devices to that switch. Hardware support for IGMP is strongly recommended.
– (Optional) (Rapid) Spanning Tree support, in case redundant networks are used.
– (Optional) SNMPv3 support for switch supervision purposes.

Routers

The following minimal requirements apply to routers:

– 1 Gbit or higher Ethernet ports.
– Supports PIM-DM or Bidirectional PIM.
– Performs IP routing in hardware (i.e. a 'layer 3 switch') to minimize the routing delay.
– Packet forwarding rate > 1,000,000 packets per second per port (e.g. 8 Mpps for an 8-port router).
– Non-blocking backplane per switching port, i.e. 2 Gbit per port (e.g. 16 Gbps for an 8-port router).
– MAC address table of at least 1000 addresses per directly connected subnet.

4.3   Power supply capacity calculation plan

How to start

Notice!

It is advisable to use the power calculation tool. The calculation tool is on the DVD supplied with the Audio Powering Switch and is also part of the DICENTIS software DCNM.iso file, which can be downloaded from the Bosch website at: https://licensing.boschsecurity.com/software

Decide how to supply power to the DICENTIS devices:
–   Using the Audio Powering Switch and one or more Powering Switches.
–   Using one or more PoE Ethernet switches.
If you want to use PoE Ethernet switches, continue with chapter *Calculation using PoE switches, page 19*.

See also
–   *Calculation using DCNM-APS(2) or DCNM-PS(2), page 17*
–   *Installation material and tools, page 26*

4.3.1   Calculation using DCNM-APS(2) or DCNM-PS(2)

Notice!

If you want to use customized cables, or a more accurate power supply capacity calculation plan is needed, you should use the power calculation tool.

To calculate the total power supply capacity:
1.   Count all DICENTIS devices.
2.   Know the exact location where the devices are installed.
3.   Count each system network cable of the same length.

Device type	Power consumption (Watts)
DCNM-D	3.1
DCNM-DSL	3.6
DCNM-DVT	3.7
DCNM-DE	5.00
DCNM-MMD	11.30
DCNM-MMD2	12.00
DCNM-CB02	1.19
DCNM-CB05	2.43
DCNM-CB10	4.50
DCNM-CB25	10.71

Table 4.1: Power consumption (Watts)

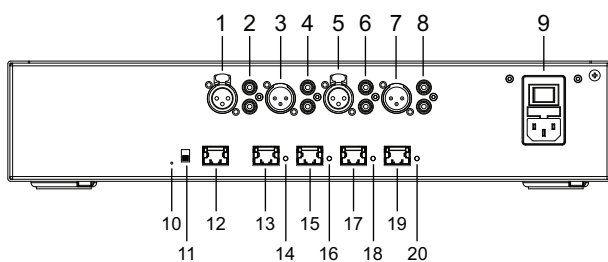| Ordering number	Cable lengths	
	m	**ft**
DCNM-CB02	2	6.56
DCNM-CB05	5	16.40
DCNM-CB10	10	32.81
DCNM-CB25	25	82.02

Table 4.2: Cable types and lengths

Rear view
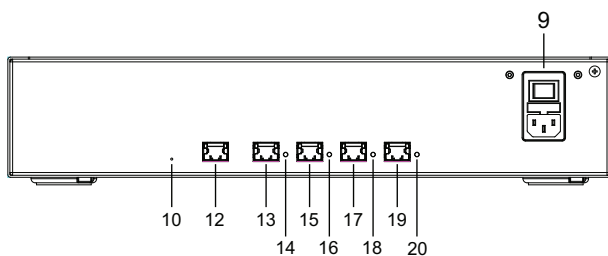

Figure 4.2: Audio Powering Switch

Figure 4.3: Powering Switch

Item	Description
1, 5	XLR line outputs 1 and 2.
2, 6	RCA line outputs 1 and 2.
3, 7	XLR line inputs 1 and 2.
4, 8	RCA line inputs 1 and 2.
9	Mains inlet, mains switch and fuse holder.
10	Reset button.
11	Ground switch (grounded or floating).
12	Socket 1 without power.
13	Socket 2 low power.

Item	Description
15, 17, 19	Socket 3, 4, 5 high power.
14, 16, 18, 20	**Overload LED** for sockets 2-5: **Green**: Power OK. **Red**: Overload. Remove cable and wait a few seconds for the system to reset the overload.

Network and Power connector	Max. power output (W)	Max. devices
Socket 1 (12)	No power capacity	---
Socket 2 (13)	15	1
Socket 3 (15)	144	40
Socket 4 (17)	144	40
Socket 5 (19)	144	40

Table 4.3: Power supply capacity DCNM-APS(2) / DCNM-PS(2)

Calculation examples

The following example gives you an indication of the maximum load to each socket of an Audio Powering Switch or Powering Switch.

– **Socket 2**: 50 m cable + DCNM-MMD2 = **12 W**[1]
– **Socket 3**: 10 m cable + DCNM-MMD2 + 9x (2 m cable + DCNM-MMD2)
  = (4.5 + 12) + 9x(1.19 + 12) = **135.21 W**[2].
– **Socket 4**: 10 m cable + DCNM-D + 19x (2 m cable +DCNM-D)
  = (4.5 + 3.1) + 19x(1.19 + 3.1) = **89.11 W**[2].
– **Socket 5**: 10 m cable + DCNM-DE + 19x (2 m cable + DCNM-DE)
  = (4.5 + 5) + 19x(1.19 + 5) = **127.11 W**[2].

[1] For socket 2, the cable power consumption of the cable does not need to be counted if only one device is connected to this output.

[2] The shortest redundant cable does not need to be counted.

4.3.2   Calculation using PoE switches

Select one or more PoE Ethernet switches to supply power to the DICENTIS devices. Each DICENTIS device must be connected to an individual PoE enabled output of an Ethernet switch.

Notice!

Some PoE Ethernet switches can only supply power to a limited number of ports. Others can supply power to every port, but the total power the Ethernet switch can supply is limited. Please consult the documentation of the PoE Ethernet switch used.

Notice!

Using PoE, DICENTIS devices cannot be daisy-chained connected. Using PoE does not provide redundant cabling.
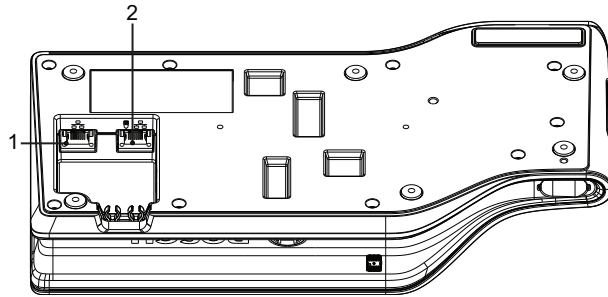
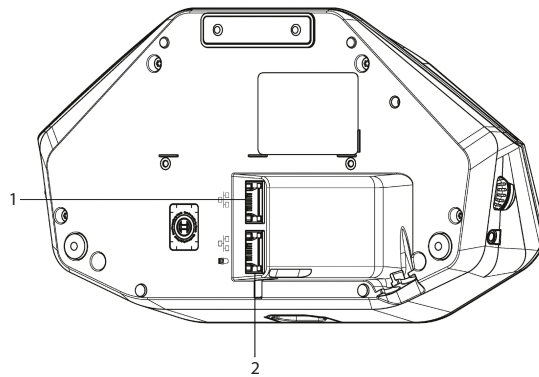**Figure 4.4: Bottom view DICENTIS devices (DCNM-MMD / DCNM-MMD2)**

Figure 4.5: Bottom view DICENTIS devices (DCNM-D / DCNM-DVT / DCNM-DSL / DCNM-DE)

Item	Description
1	Network connector
2	Network/PoE connector

4.4 Redundancy options

DICENTIS Conference Systems can be created with network redundancy. This ensures that the system will continue to work if:
– a network cable is defective or accidentally disconnected.
– one of the components fails.

Different levels of redundancy can be created in the system depending on:
– the type of unit used in the system (DCNM-APS / DCNM-PS or DCNM-APS2 / DCNM-PS2)
– the number of redundant components used in the system.
– the amount of redundant network cabling.

The following sections explain the redundancy options that can be used when designing your DICENTIS Conference System. Each option can be combined in the DICENTIS Conference System, providing you observe the redundant cabling limitations. Refer to:

i	**Notice!** Rapid Spanning Tree Protocol (RSTP) must be enabled in the DICENTIS Conference System for these redundancy options to work correctly.

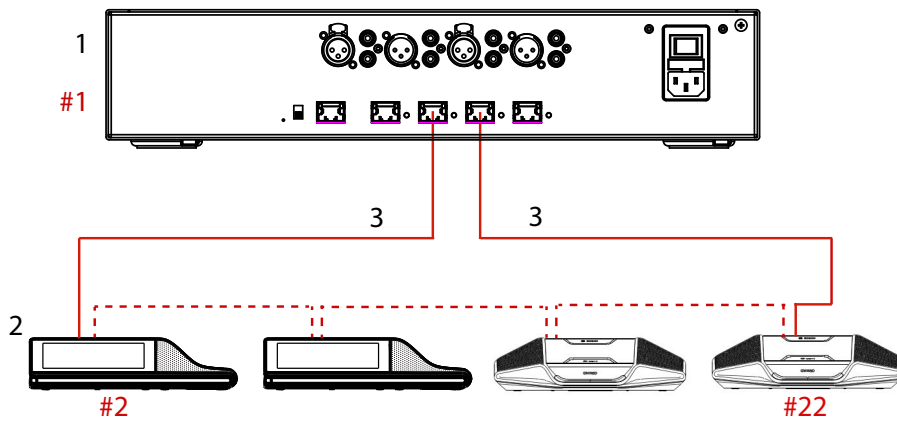## 4.4.1   Redundant cabling for DCNM-APS/DCNM-PS units

This section describes how to create redundant cabling for DCNM-APS or DCNM-PS units. The maximum number of Ethernet devices in the loop (including the root switch) is 22. In a system with no Ethernet switch(es), the APS is the root switch.

The total number of devices allowed in a loop depends on:

– The type of device connected in the loop (for example, DCNM-MMD2 devices consume more power than DCNM-DE devices).
– The length of the loop (cable also consumes power).

The figure shows how to calculate the number of devices in the loop. The red line shows the largest loop. The # sign shows the way the devices are counted.

In the example below up to 21 discussion devices can be connected.

Figure 4.6: DICENTIS devices connected with redundant cabling to the same DCNM-APS / DCNM-PS type unit

1: DCNM-APS or DCNM-PS.
2: DICENTIS devices.
3: DICENTIS cabling (redundant loop).

Cabling possibilities (DCNM-APS/DCNM-PS)	Limitations/requirements
Connect the DICENTIS devices in a daisy chain configuration from a high power socket on a DCNM-PS or DCNM-APS to another high power socket on the same DCNM-PS or DCNM-APS.	The redundancy is for cable only. If the DCNM-PS or DCNM-APS fails, all DICENTIS devices connected to that unit will also fail. If a single DICENTIS device fails, the other DICENTIS devices in the daisy chain will continue to work. To enable redundancy, Rapid Spanning Tree Protocol (RSTP) must be enabled.
You can use any of the high power sockets (3, 4, or 5) to create the daisy chain.	The redundant loop must be connected to the same DCNM-APS or same DCNM-PS.

See also

– *Power supply capacity calculation plan, page 17*

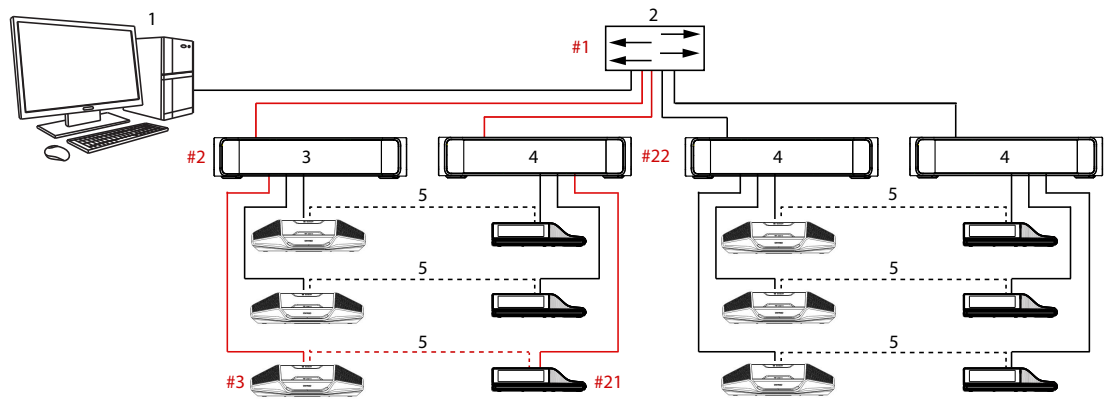## 4.4.2   Redundant cabling for DCNM-APS2/DCNM-PS2 units

This section describes how to create redundant cabling for DCNM-APS2 / DCNM-PS2 type units. The maximum number of Ethernet devices in the largest possible loop (including the root switch) is 22. In a system with no Ethernet switch(es), the APS is the root switch.

The total number of devices allowed in a loop depends on:

– The type of device connected in the loop (for example, DCNM-MMD2 devices consume more power than DCNM-DE devices).
– The length of the loop (cable also consumes power).

The figure shows how to calculate the number of devices in the loop. The red line shows the largest loop. The # sign shows the way the devices are counted.

In the example below up to 19 discussion devices can be connected.

Figure 4.7: DICENTIS discussion devices connected with redundant cabling between DCNM-PS2 / DCNM-APS2 type units

1: DICENTIS system/client PC.
2: Network switch (with optional redundant power supply)
3: DCNM-APS2
4: DCNM-PS2
5: DICENTIS cabling (redundant loop)

Cabling possibilities (DCNM-APS2/DCNM-PS2)	Limitations/requirements
Create a redundant loop by connecting the DICENTIS devices in a daisy chain configuration from a high power socket on a DCNM-PS2 / DCNM-APS2 to a high power socket on another DCNM-PS2. The redundant loop between two DCNM-PS2 units is for power and signal. If one of the DCNM-PS2 units fails, the other DCNM-PS2 unit will supply power and signal to the DICENTIS devices in the daisy chain.	The redundancy is for cable only. If the DCNM-PS or DCNM-APS fails, all DICENTIS devices connected to that unit will also fail. To enable redundancy: – Rapid Spanning Tree Protocol (RSTP) must be enabled in the DICENTIS Conference System. – a network switch with redundant power supply, should be connected to the DCNM-PS2 / DCNM-APS2 units, as shown in the previous figure.
You can use any of the high power sockets (3, 4, or 5) on either of the DCNM-PS2 units to create the daisy chain/redundant loop. For example, high power socket 3 on one unit can be connected to high power socket 4 on another unit.	**Note**: The redundant loop must be connected to another DCNM-PS2 type unit. You cannot use DCNM-PS / DCNM-APS type units to create redundant loops for power.
You can create a redundant loop for signal only, by connecting the DICENTIS devices in a daisy chain configuration to the same DCNM-PS2 or DCNM-APS2, although this is not recommended. The DCNM-PS2 unit is designed to reduce cost of ownership, for example, by allowing a maximum of three redundant loops to be connected between two DCNM-PS2 units.	The redundant loop will function in the same way as a DCNM-PS / DCNM-APS type unit. Refer to *Redundant cabling for DCNM-APS/ DCNM-PS units, page 22*.

> **i**
>
> **Notice!**
> Rapid Spanning Tree Protocol (RSTP) must be enabled in the DICENTIS Conference System for these redundancy options to work correctly.

See also
– *Power supply capacity calculation plan, page 17*
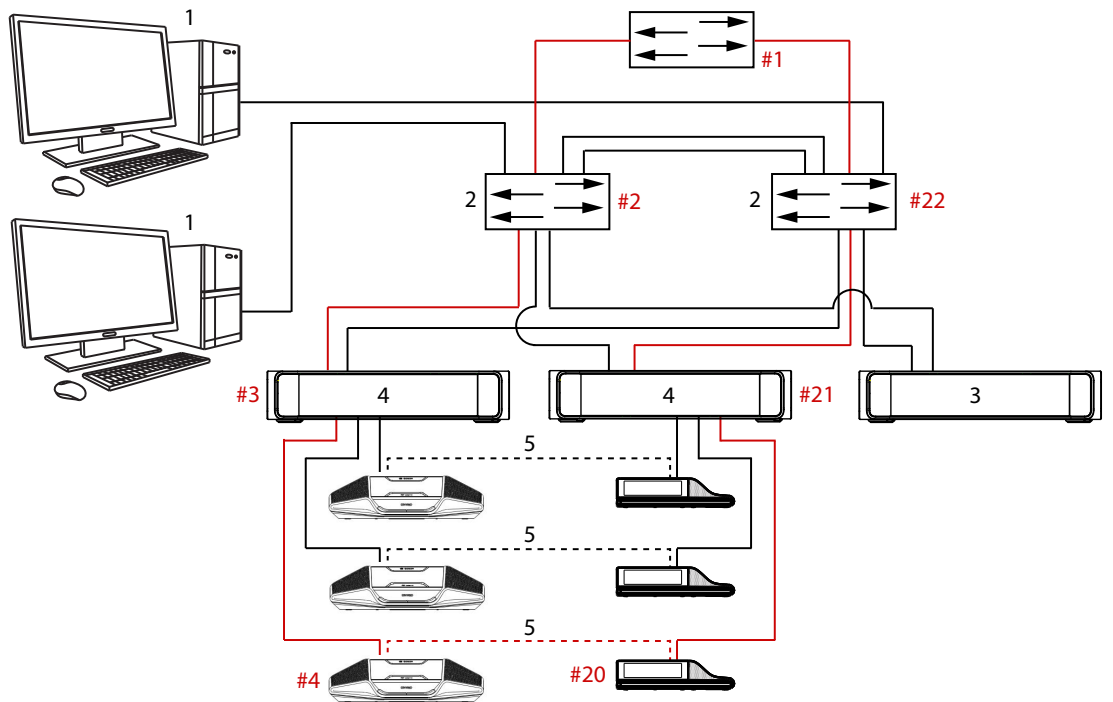
4.4.3 Redundant server PC

System availability can be improved by connecting a redundant DICENTIS server PC and the associated components and cables to the DICENTIS Conference System. The maximum number of Ethernet devices in the largest possible loop (including the root switch) is 22.
The total number of devices allowed in a loop depends on:
– The type of device connected in the loop (for example, DCNM-MMD2 devices consume more power than DCNM-DE devices).
– The length of the loop (cable also consumes power).
The figure shows how to calculate the number of devices in the loop. The red line shows the largest loop. The # sign shows the way the devices are counted.
In the example below up to 17 devices can be connected.

Figure 4.8: Redundant DICENTIS server PC with redundant components and cables
1: DICENTIS system/client PC
2: Network switch (with optional redundant power supply)
3: DCNM-APS2
4: DCNM-PS2
5: DICENTIS cabling (redundant loop)

For this option to work the DICENTIS Conference System has to be run in combination with EverRun Enterprise software from Stratus Technologies. For more information, refer to the Stratus Technologies website.
Other options that can be used for guaranteeing the reliability of the DICENTIS Conference System include:
– Remote SQL servers.