IP DECT Deployment on Ships

IP DECT 6000 System

VINGTOR

DEPLOYMENT GUIDE

A100K10676

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1 About this Document

This document contains guidelines for deploying the IP DECT 6000 System on ships, and is intended for qualified technicians who will install, configure and maintain the system onboard.

The IP DECT 6000 System comprises the following:

Product	Part Number
IP DECT Server 6000	2211000100
IP DECT Base Station	2211000600
Repeater Wall / Repeater Ceiling	2211050100 / 2211050110
DECT Handsets	2211100501, 2211100502, 2211100503, 2211100504
IP DECT Alarm Server	2210020000
IP DECT Base Station with 100m Leaky Cable and Mounting Kit	2211000605

☞ *The installation and configuration of the Server 6000 and the Alarm Server are described in the corresponding manuals as listed under **Related Documentation** below.*

1.1 Before You Begin

This document assumes the following:

- You have a working knowledge of AlphaCom/ACM exchange operations and that the exchange is installed and initialized and is working properly.
- You have a working knowledge of deployment in general.
- A site survey has been conducted and the installer has access to these plans. The site survey should determine the number of handsets and RF channels that are needed.

1.2 Revision Information

Rev.	Date	Author	Status
1.0	28-10-2009	HKL	Published
1.5	25-1-2011	HKL	handsets

1.3 Related Documentation

For further information about the IP DECT Server 6000 not covered by this manual, refer to the following documentation:

Doc. no.	Subject	Documentation
A100K10652	IP DECT 6000 System	IP DECT Installation & Configuration Guide
A100K10677	IP DECT Alarm Server	IP DECT Alarm Server Configuration Guide
A100K10777	IP DECT 6000 Configuration	IP DECT Quick Configuration Guide
	DECT Handset Operation	Handset User Guides

2 IP DECT 6000 System

The main components of the IP DECT 6000 System on ships are:

- IP DECT Server 6000
- Base Station
- Leaky antenna cable
- Repeater
- Handset
- Alarm Server
- Administrative Computer

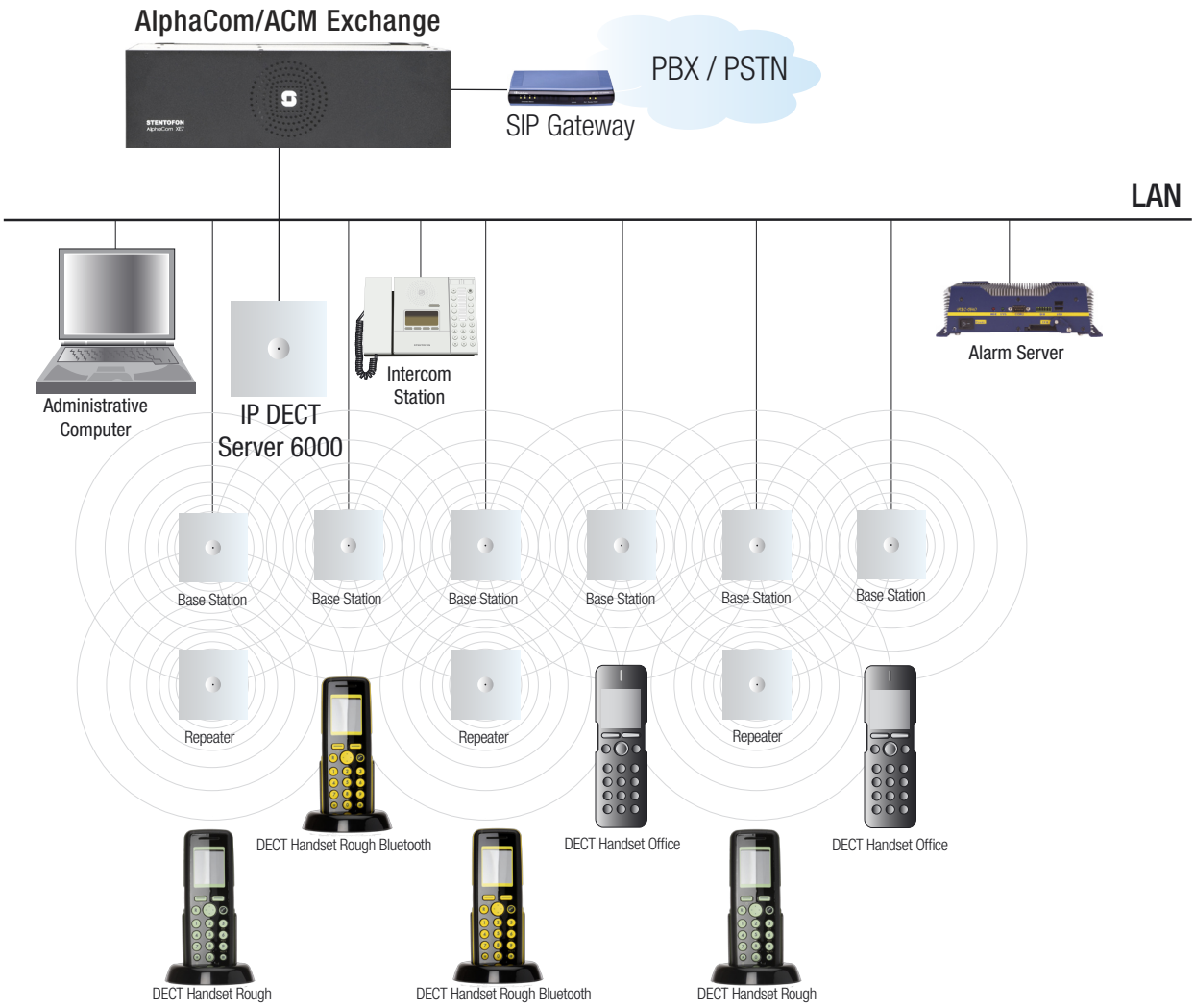


Figure 1 IP DECT 6000 System Configuration

3.3.1 Synchronization over Air

Base stations must be placed in such a way that overlap of radio coverage between the base stations is established.

As a user moves from one base station radio coverage area to another, the call must be handed over to the next base station. To create handover between base stations, it is necessary to establish synchronization chains. If synchronization between base stations is lost, then handover is not possible and ongoing calls will be terminated.

☞ *Each base station must be placed within the radio coverage area of at least one other base station.*

3.3.2 Examples of Synchronization Chains

Certain rules must be taken into consideration when establishing synchronization chains:

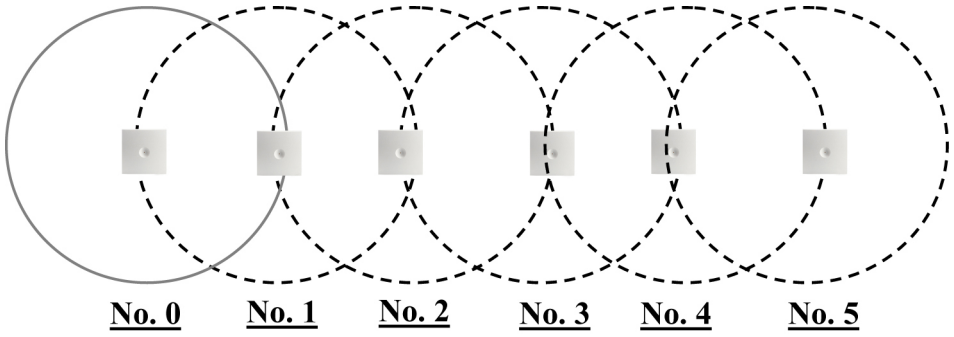
- The distance over which synchronization can take place is limited to a distance similar to a loss not exceeding 25 dB. If signal loss exceeds 25 dB, it is not certain that synchronization will be stable.
  - For example, the signal measured next to the base station is 100 dB. The handset with test display active is moved away from the base station until the reading in the display shows 75 dB. This is the spot where the next base station should be installed.
- It is recommended that a base station synchronizes with at least two other base stations, and that a secondary sync way is defined to ensure system redundancy. If the primary sync way is not working, then the secondary sync way takes over and the synchronization chain is not broken.
- Synchronization chains for the Server 6000 Solution can be made with base stations.

As the Server 6000 uses the DECT interface to synchronize on, one base station is configured as the Sync Master. It is recommended to place the Sync Master on the deck that is mid-way between the decks of the vessel.

It is recommended to make a site plan. Every base station must be numbered with Radio ID, Primary sync Radio ID, and Secondary sync Radio ID.

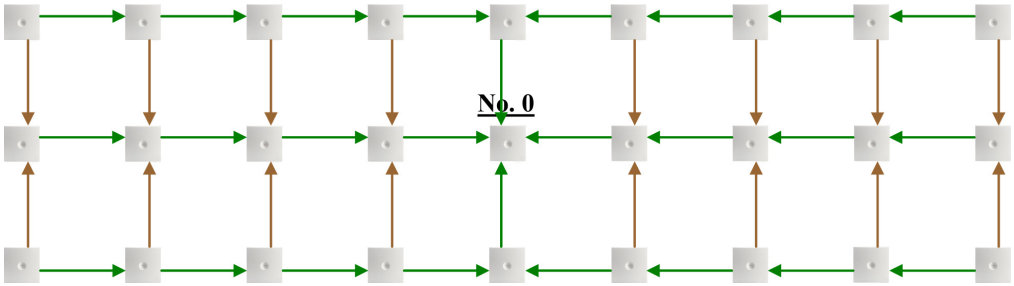
3.3.2.1 Sync Chain With One Sync Master (Primary Sync Ways)

Figure 2 Synchronization Chain



- The synchronization chain must always overlap with the base station to sync on.
- No. 0 is the Sync Master (can be numbered 0 to 255).
- Other base stations are connected to the Sync Master through the synchronization chain.
- If one of the base stations in the synchronization chain is not working, then all base stations behind are also not working.

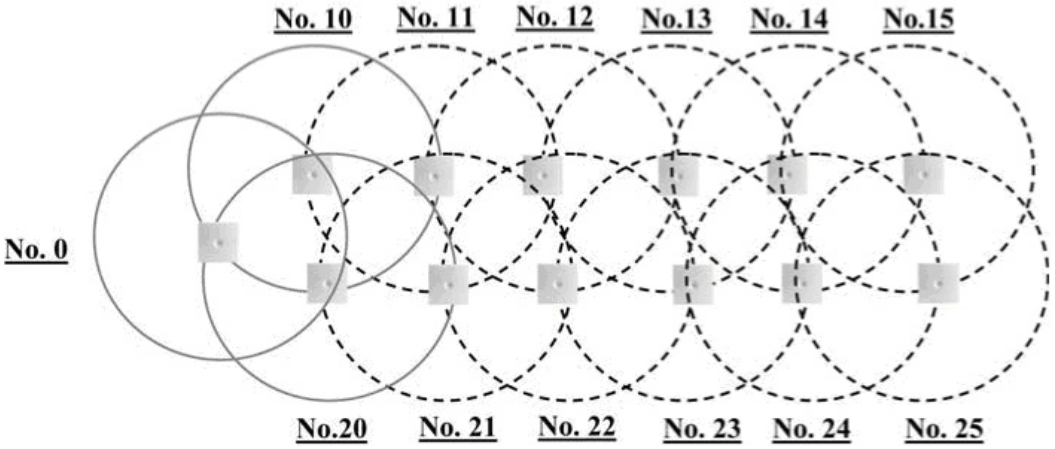
Figure 3 Synchronization Chain Layout without Secondary Sync Ways



- **No. 0** is the Sync Master (can be numbered 0 to 255).
- Green line: Shows the primary sync ways.
- Brown line: Only handover overlap is needed.

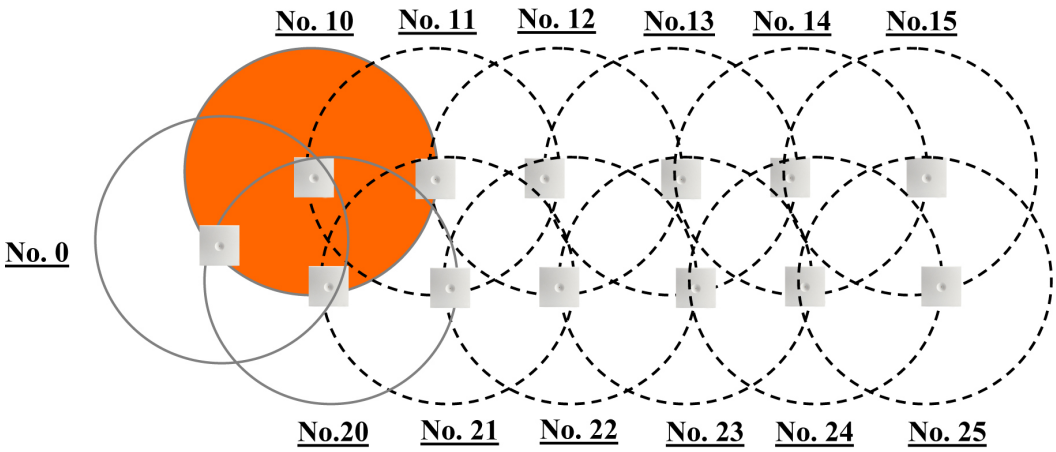
3.3.2.2 Synchronization Chain With Secondary Sync Ways

Figure 4 Synchronization Chain with Secondary Sync Ways



- No. 0 is the Sync Master (may be numbered 0 to 255).
- No. 10 and No. 20: Primary and secondary sync on No. 0.
- No. 11: Primary sync on No. 10 and secondary sync on No. 21.

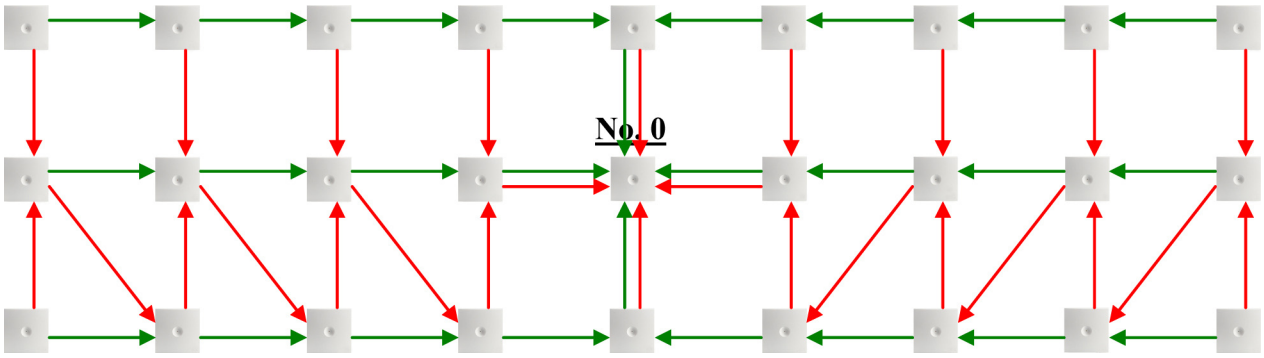
Figure 5 Synchronization Chain with Secondary Sync Ways



- No. 0 is the Sync Master (may be numbered 0 to 255).
- No. 10 and No. 20: Primary and secondary sync on No. 0.
- No. 11: Primary sync on No. 10 and secondary sync on No. 21.

In the example above, base station No. 10 is down. Consequently, base station No. 11 must use the secondary sync way on base station No. 21.

Figure 6 Sync Chain showing Primary & Secondary Sync Ways



- **No. 0** is the Sync Master (may be numbered 0 to 255).
- Green line: Shows the primary sync ways.
- Red line: Shows the secondary sync ways.

For more information, please refer to the *IP DECT 6000 System Installation & Configuration Guide*.

4 General Layout of a Ship

In deploying the IP DECT system, guidelines should be followed for the three separate areas on the ship:

- accommodations and bridge
- below main deck
- outdoor areas

The main components of the IP DECT system on the vessel are:

- Server 6000
- Base stations
- Leaky antenna cable

4.1 Accommodations and Bridge

This area comprises the cabins, mess, wardrobe, and bridge above the main deck and covers several decks. In our example, the area includes the Bridge Deck, and the Third, Second, and First Decks.

4.2 Below Main Deck

This area comprises the engine room, engine control room, pump rooms, switchboard room, and storage rooms and covers several decks. In our example, Below Main Deck comprises the Tween Deck and Tank Top Deck.

4.3 Outdoor Areas

This area comprises the main open area of the Main Deck, the “terrace corridor” one deck above (e.g. First Deck) the outer edges of the Main Deck, the work areas at the outer edges of the Main Deck, and the hangar.

4.4 Base Stations

The base station is usually mounted on the wall using the accompanying anchors and screws. The base station has two built-in diversity antennas and is directional. Depending on the materials and construction of the vessel, the maximum coverage area for the base station is approximately 50 meters indoors and approximately 150 meters outdoors.

It can be deployed in accommodation and outdoor areas, as well as below main deck in rooms with many installations – like the pump and engine rooms.

4.4.1 Recommended placement of base stations

- In optimal conditions, there should be no more than 20 x 20 meters between base stations.
- There should be at least 1 base station for each deck, one fore and one aft
  - depending on deck and vessel size, there should also be one reserve PoE point for the potential deployment of base stations
- For each deck, there should be one base station on the port side and one diagonally opposite on the starboard side.

- The base stations should be placed in a “z-configuration” from deck to deck due to the spherical coverage area from each base station.

4.5 Leaky Cable Solution

This solution comprises a leaky or radiating cable that is connected to a specially modified base station with two antenna ports. The radio signals can then be sent through the cable which then radiates the signals. This type of leaky cable and base station solution is mainly used below the main deck and in rooms having little or no equipment in them.

The handover between base stations and air synchronization are difficult for rooms that are separated by steel walls.

The Leaky Cable Solution is ideal for deployment in the Below Main Deck areas, i.e. the lower pump room, storage rooms between the fore and aft engine rooms, rooms enclosing the moon pool, and steel corridors and narrow spaces.

Leaky cables have the following advantages over standard base stations:

- no handover is needed when moving between rooms/sections as the cable goes straight through the wall
- air sync can be taken in from a base station at the end of the leaky cable
- the end of the leaky cable and the synching base stations can easily be in the same room
- there is less reflection in the “boxy” rooms due to weaker signal (the signal is divided between separate rooms)
- signals are able to penetrate through water-tight doors

4.6 Repeaters

Repeaters are generally not recommended for use on ships, except for areas where there are “coverage holes”, and there is no other way of closing them. The reason for this is that a repeater requires at least four air-hops from handset to base and back from base to handset, while a base station only requires a maximum of two air-hops. The sound quality deteriorates with each air-hop.

☞ *Repeaters should only be deployed where there is no coverage from the implemented LAN network after base station PoE points have already been installed. Repeaters only require 230VAC.*

There are two types of repeaters available:

- Base Repeater Wall
- Base Repeater Ceiling

The Base Repeater Ceiling is especially suited for use in corridors.

5 Deployment Example of Onboard DECT System

5.1 DECT Deployment based on GA Plan

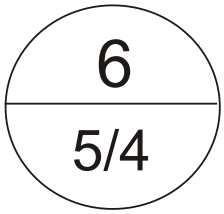
Before you install the IP DECT 6000 System on the vessel, it is necessary to carry out a complete site design based on the GA plan to determine the exact location of the Server 6000 and base stations, as well as the number of handsets required.

☞ *The vessel that we are using as an example for the IP DECT deployment is a Multipurpose ROV Field Support & Construction Ship.*

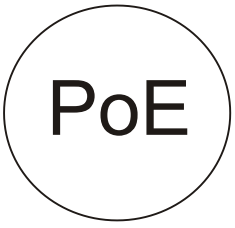
The deployment of the PoE/base station points covers several decks. In our example, the Bridge Deck is at the topmost level, the next level down is the Third Deck, then the Second Deck, the First Deck, the Main Deck followed by the Below Main Deck areas, namely the Tween Deck and the Top Tank Deck.

In our deployment example, the Sync Master base station is installed on the Main Deck, which is approximately midway between the decks above and below it. All the base stations from the decks above and below the Main Deck have primary sync ways that lead to the Sync Master on that deck. The main consideration here is to implement a synchronization chain that remains intact throughout the multi-cell system onboard ship.

5.2 Base Station / PoE Point Notation



The circle in the illustration at each base station point contains three numbers: the one in the upper half of the circle is the number of the base station itself, and the two in the lower half are the numbers of the base stations on which it syncs with. The first number below the line is the primary base for synching and the number after the slash is the secondary base for synching. There are no functional differences between primary and secondary syncs. To ensure system redundancy, if the primary sync way is not working, then the secondary sync way takes over and the synchronization chain is not broken. In this example, base station 6 has a primary sync with base station 5 and a secondary sync with base station 4.



'PoE' in the circle means that this is a PoE point that is cabled and ready for extra base stations to be installed if the need arises.

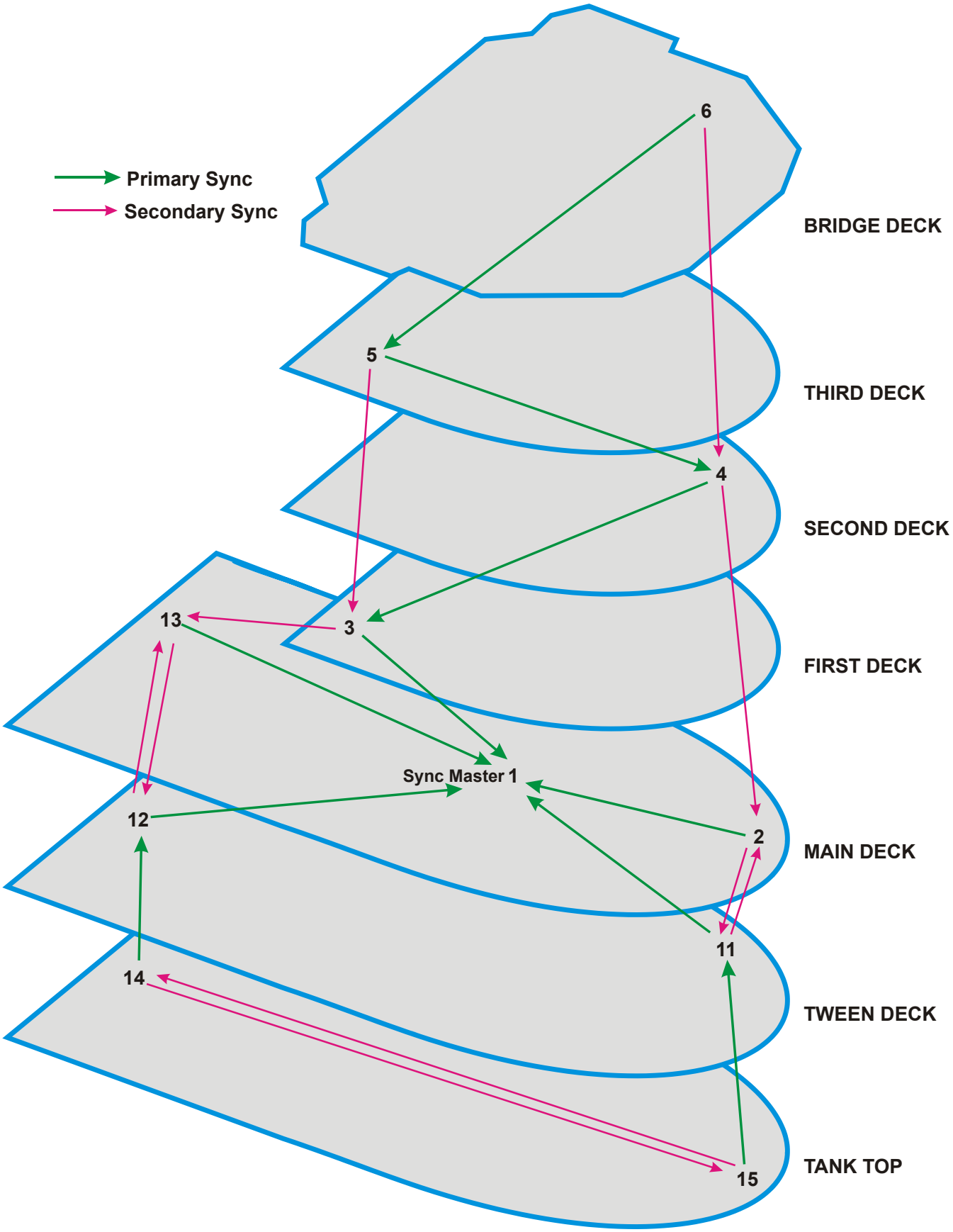
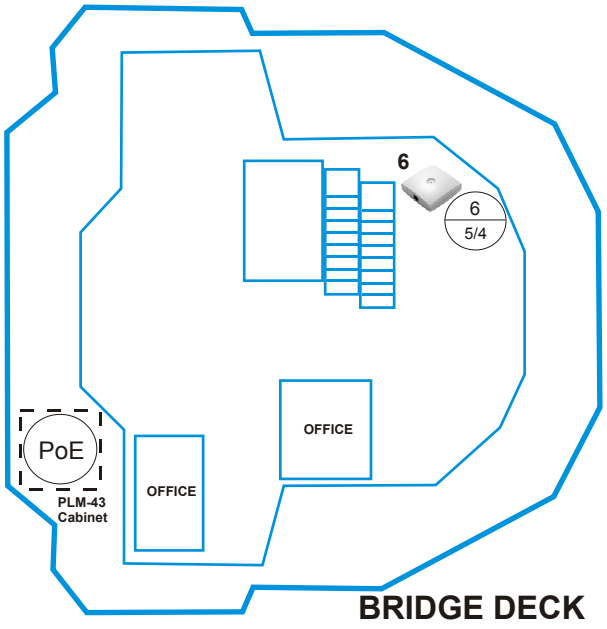


Figure 7 Overview of Primary and Secondary Sync Ways for all Decks

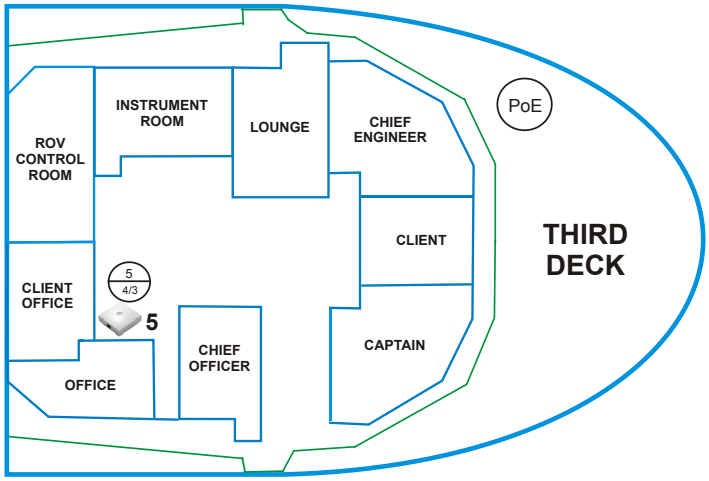
5.3 Bridge Deck

Base station 6 on the Bridge Deck has a primary sync with base station 5 on the Third Deck. If this primary sync fails, then its secondary sync with base station 4 on the Second Deck will take over the synchronization. There is one reserve PoE point placed at a strategic location in case of potential coverage holes and a base station needs to be installed.



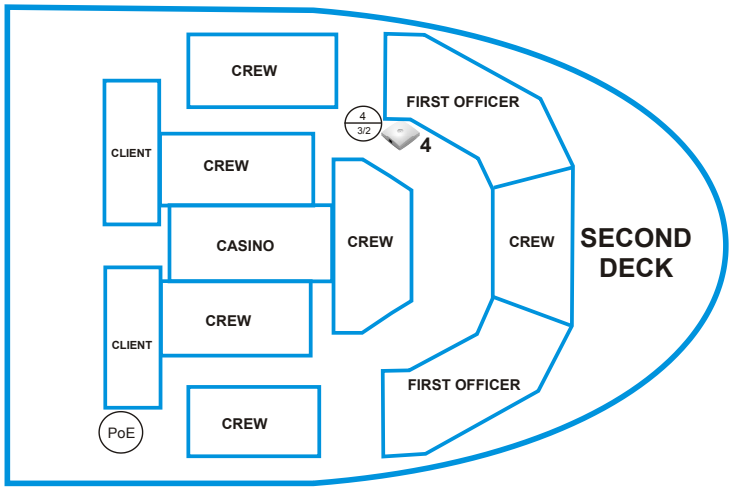
5.4 Third Deck

Base station 5 on the Third Deck has a primary sync with base station 4 on the Second Deck. If this primary sync fails, then its secondary sync with base station 3 on the First Deck will take over the synchronization. There is one reserve PoE point placed at a strategic location in case of potential coverage holes and a base station needs to be installed.



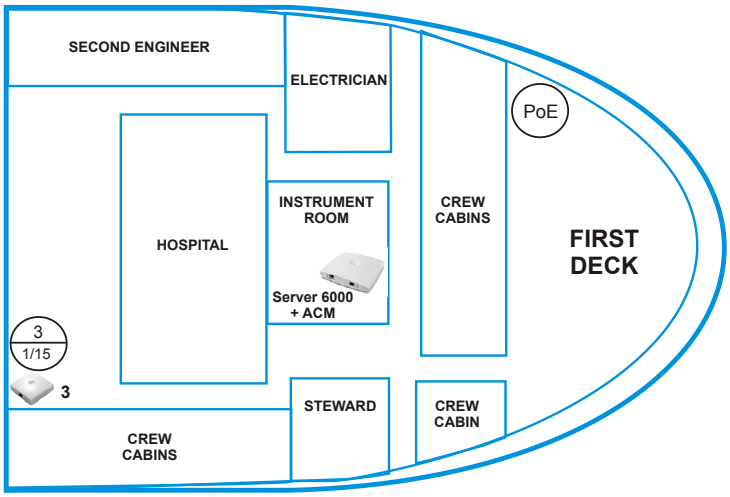
5.5 Second Deck

Base station 4 on the Second Deck has a primary sync with base station 3 on the First Deck. If this primary sync fails, then its secondary sync with base station 2 on the Main Deck will take over the synchronization. There is one reserve PoE point placed at a strategic location in case of potential coverage holes and a base station needs to be installed.



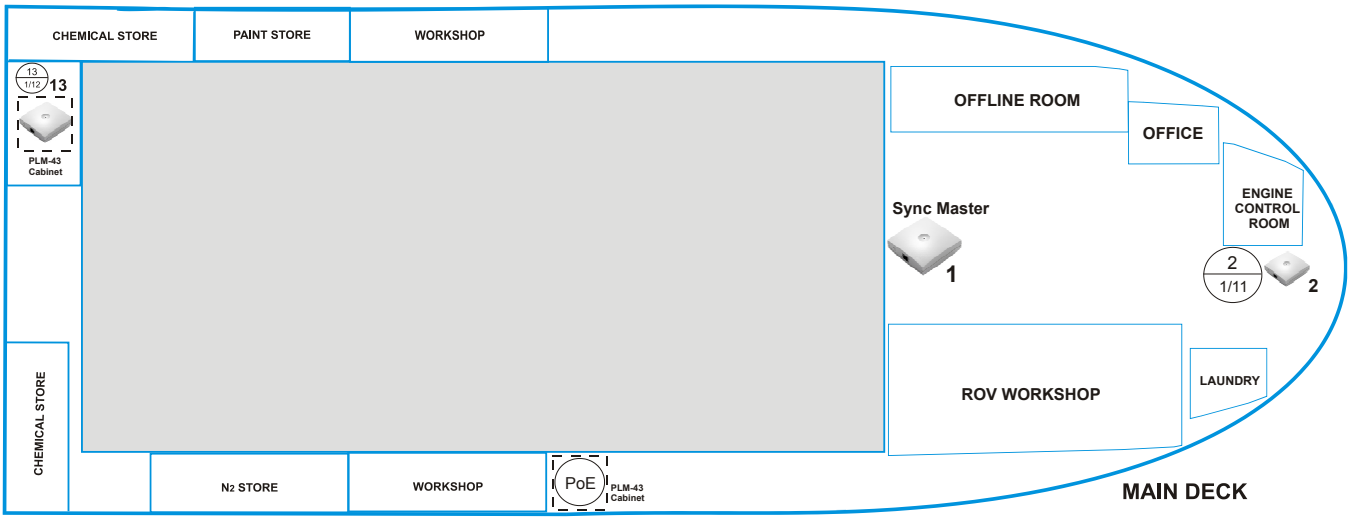
5.6 First Deck

Base station 3 on the First Deck has a primary sync with Sync Master 1 on the Main Deck. If this primary sync fails, then its secondary sync with base station 15 on the Main Deck will take over the synchronization. There is one reserve PoE point placed at a strategic location in case of potential coverage holes and a base station needs to be installed.



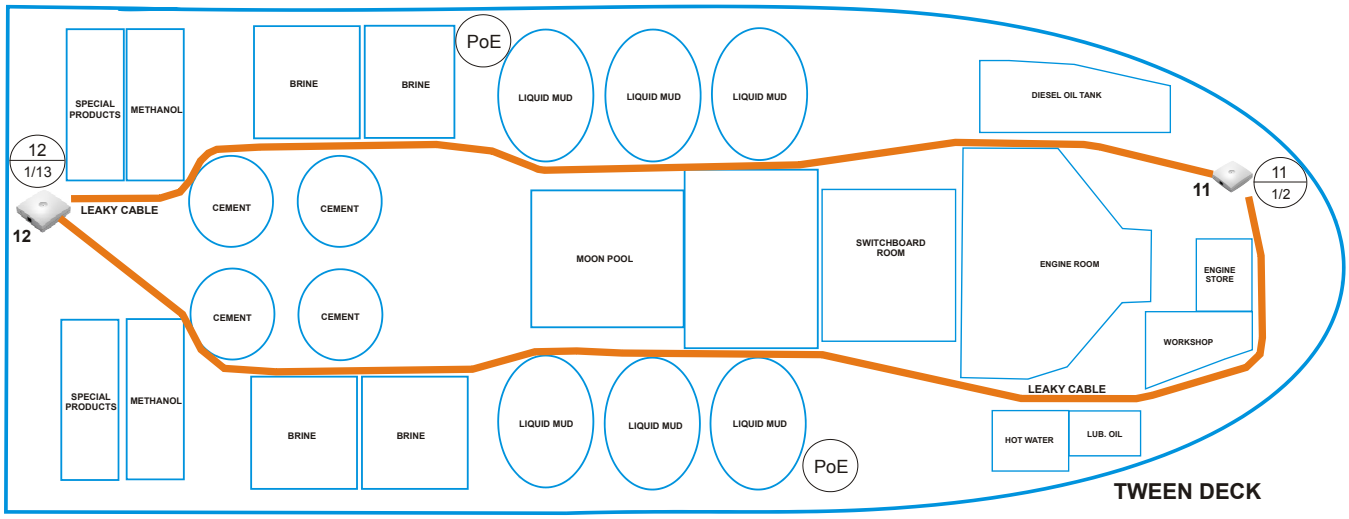
5.7 Main Deck

Base station 2 on the Main Deck has a primary sync with Sync Master 1 on the same deck. If this primary sync fails, then its secondary sync with base station 11 on the Tween Deck will take over the synchronization. Base station 13 has a primary sync with Sync Master 1. If this primary sync fails, then its secondary sync with base station 12 on the Tween Deck will take over the synchronization. There is one reserve PoE point placed at a strategic location in case of potential coverage holes and a base station needs to be installed.



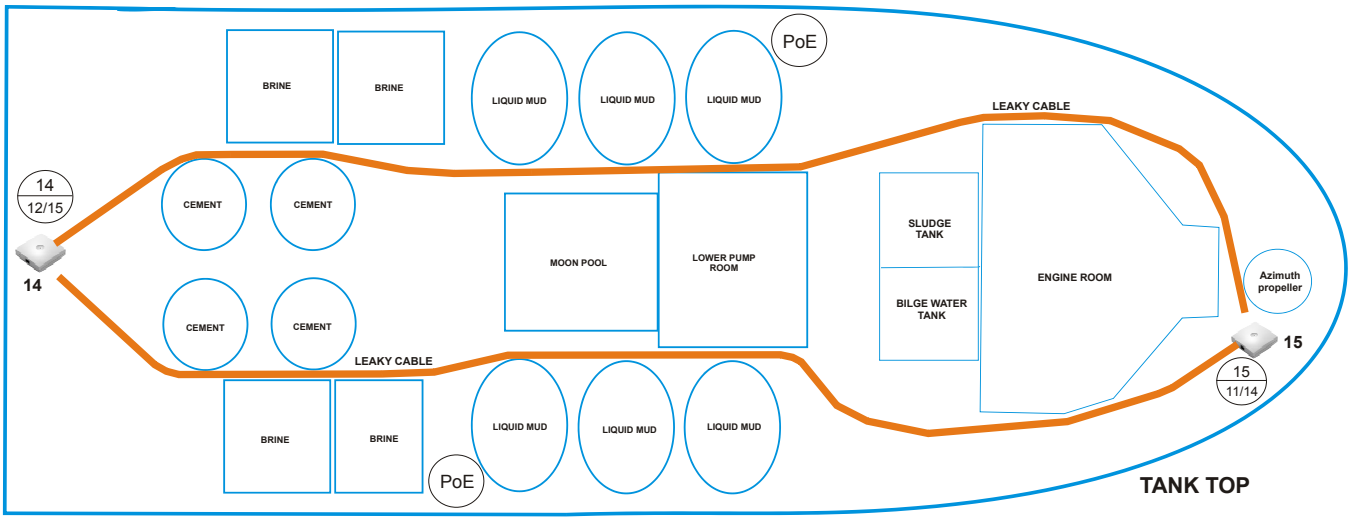
5.8 Tween Deck

Base stations 11 and 12 on the Tween Deck form parts of two leaky cable solutions. Base station 11 has a primary sync with Sync Master 1 on the Main Deck. If this primary sync fails, then its secondary sync with base station 2 on the Main Deck will take over the synchronization. Base station 12 has a primary sync with Sync Master 1. If this primary sync fails, then its secondary sync with base station 13 on the Main Deck will take over the synchronization. There are two reserve PoE points placed at strategic locations in case of potential coverage holes and more base stations or leaky cables need to be installed.



5.9 Tank Top Deck

Base stations 14 and 15 on the Tank Top Deck form parts of two leaky cable solutions. Base station 14 has a primary sync with base station 12 on the Tween Deck. If this primary sync fails, then its secondary sync with base station 15 will take over the synchronization. Base station 15 has a primary sync with base station 11 on the Tween Deck. If this primary sync fails, then its secondary sync with base station 14 will take over the synchronization. There are two reserve PoE points placed at strategic locations in case of potential coverage holes and more base stations or leaky cables need to be installed.



6 Deployment Guideline for Accommodations & Bridge

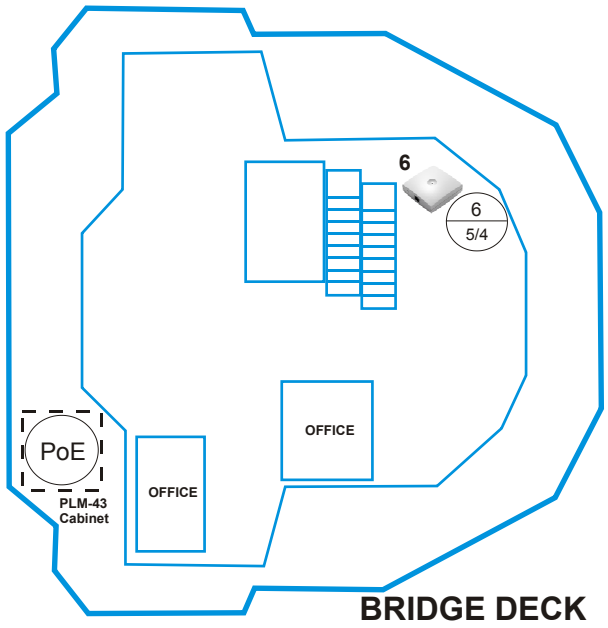
The Accommodations and Bridge areas (comprising several decks) normally comprise the following:

- cabins, mess, wardrobe
- all other areas above the main deck, including client office, rest and sleeping areas.

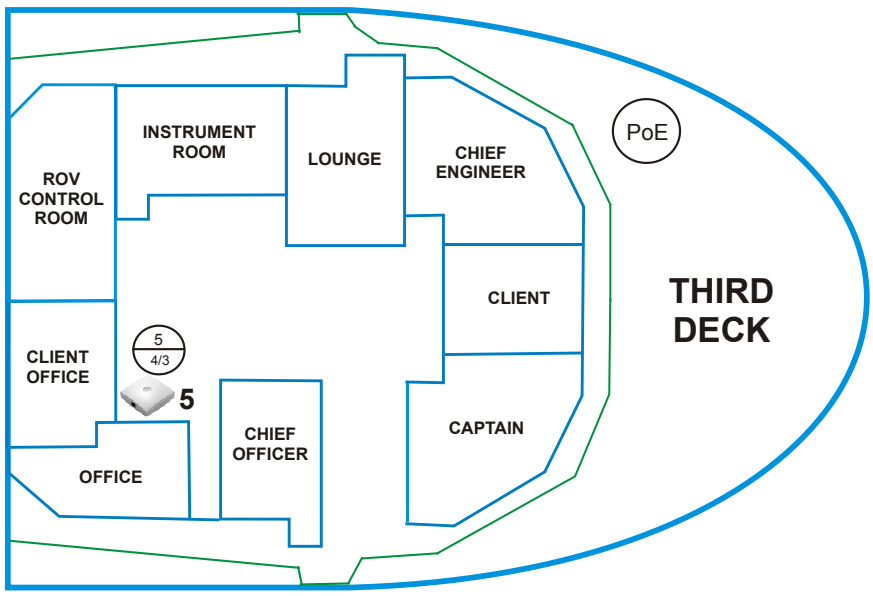
For the different decks of these areas, the following guidelines should be followed:

- each 20 x 20 meter of deck needs - under good conditions - one base station
- normally one base station on each deck should provide sufficient coverage but one PoE point should also be installed on the far side of the base station in case of coverage holes.

Example deployments for the First, Second and Third Decks, and the Bridge Deck are shown below.



For the Bridge Deck above, as the PoE point is located outdoors, it is installed in a plastic water-tight cabinet (type PLM-32 or PLM-43) to shield it from the elements.



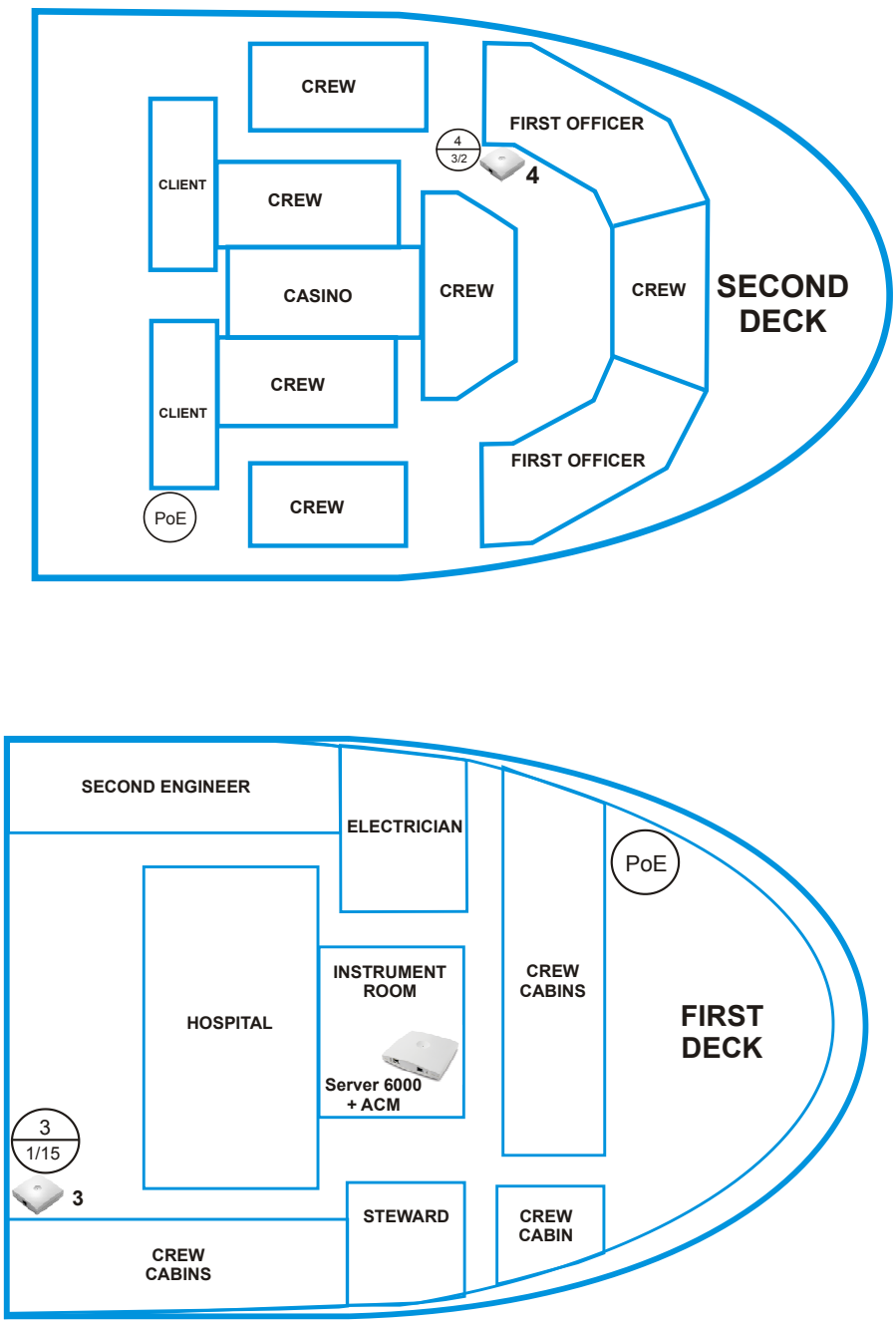


Figure 8 Base station deployment examples on First, Second, Third Decks, and Bridge Deck

Each base station is located at the end of its deck that is opposite to that of the base station it is synching with on the deck above or below. Hence, the sync way goes from deck to deck in a zig-zag fashion. This deployment configuration will provide the maximum air coverage and eliminate any potential coverage holes.

7 Deployment Guideline for Below Main Deck

The Below Main Deck area comprises the following:

- engine room
- engine control room
- pump rooms
- switchboard room
- storage rooms
- all other areas below the main deck

For these areas, the recommended guidelines for installing base stations are described below. In our example, Below Main Deck comprises the Tween Deck and Tank Top Deck.

7.1 Engine Room Deployment - Tween Deck

These areas also include the potential azimuth at the fore section of the ship. These areas usually have so much equipment already installed that one (standard) base station on one side each of the (usually) two decks are sufficient to provide proper coverage, signal strength and stability. These base stations should be able to take up air sync from the closest base station on the Main Deck above.

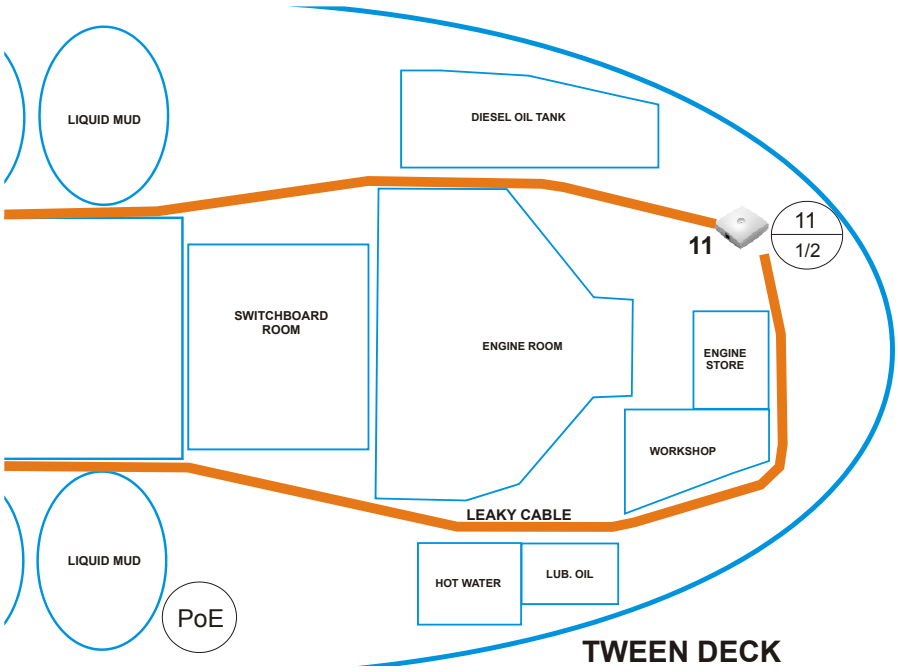


Figure 9 Base station and leaky cables in Engine Room & Front Azimuth areas on Tween Deck.

7.2 Pump and Storage Rooms Deployment

These areas include the lower pump room, storage rooms between the fore and aft engine rooms, rooms enclosing the moon pool, and steel corridors and narrow spaces.

These areas are either so square (boxy) and narrow that the radio signals never stop reflecting. The standard base station is no longer a viable option as much reflection is generated, the handover is bad between the separate sections/rooms, and the air sync is very unstable.

Consequently, it is better to employ the Leaky Cable Solution (base stations 11 and 12 on the Tween Deck and base stations 14 and 15

on the Tank Top Deck). These cables can easily stretch 100 meters in length.

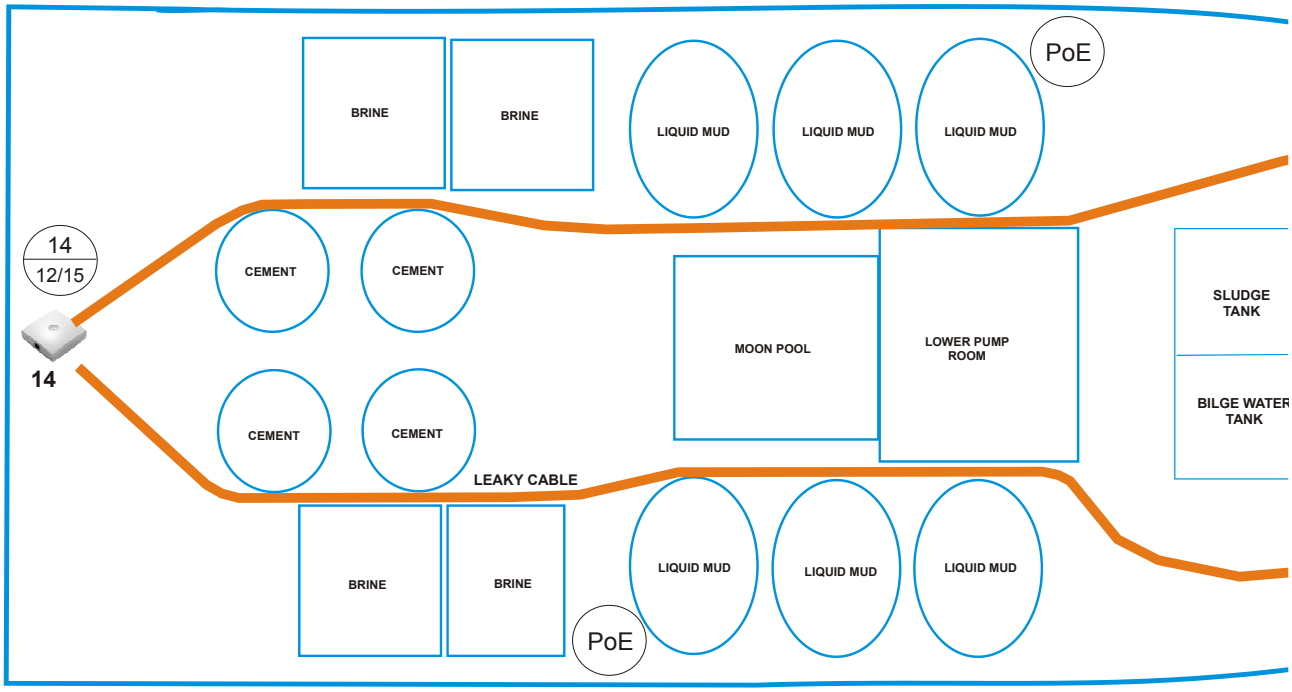


Figure 10 Base station & leaky cables in pump room and around moon pool on Tank Top Deck

In the above deployment example for the Tank Top Deck, two reserve PoE points have been installed. These will compensate for a potential situation where the leaky cables are not able to cover as far as expected. Here, a standard base station or more leaky cable may be installed.

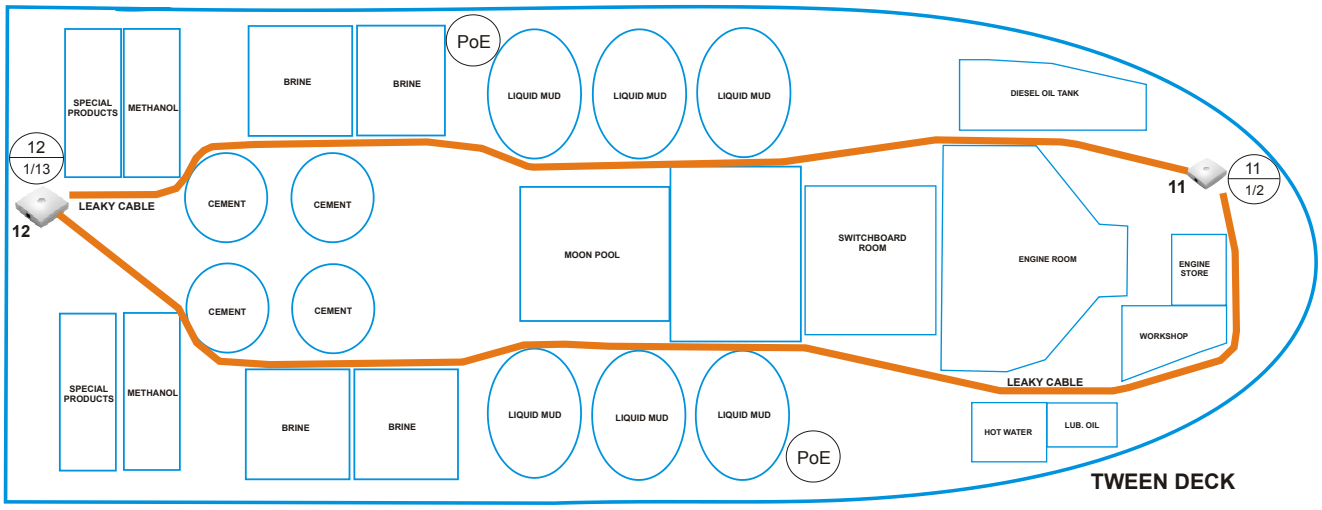


Figure 11 Base stations & leaky cables in storage rooms and corridor to aft engine rooms on Tween Deck

In the above deployment example for the Tween Deck, air sync for the narrow corridor between the storage/tank area at the fore and aft of the ship is covered by using leaky cables (base stations 11 and 12). There are two reserve PoE points installed at strategic locations in case of potential coverage holes.

8 Deployment Guideline for Outdoor Areas

The outdoor areas comprise:

- main deck
- terrace corridor one deck above the outer edges of the main deck
- work areas at the outer edges of the main deck
- hangar, i.e. the area of the ship where the ROV (Remotely Operated Vehicle) is controlled and handled.

8.1 Hangar Deployment

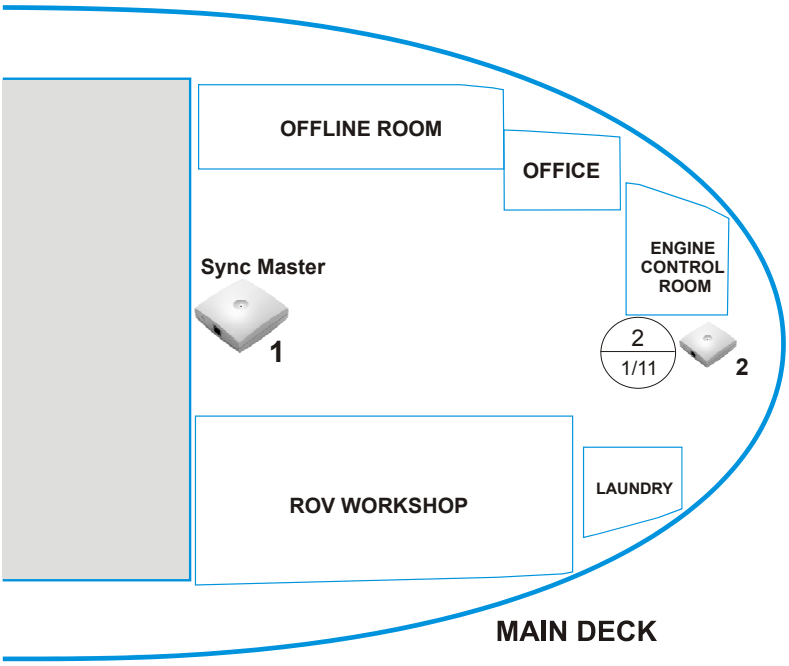


Figure 12 Sync Master base station in Hangar on Main Deck

The Hangar can best be covered by using one standard base station; in this deployment example, it is also the Sync Master (base station 1).

8.2 Main Deck Deployment

The Main Deck is not easy to cover, and we recommend using two base stations – one in the cabin area of the ship in the fore section, and one in the aft section of the ship – see figures below. One reserve PoE point is installed at a strategic location in case of potential coverage holes.

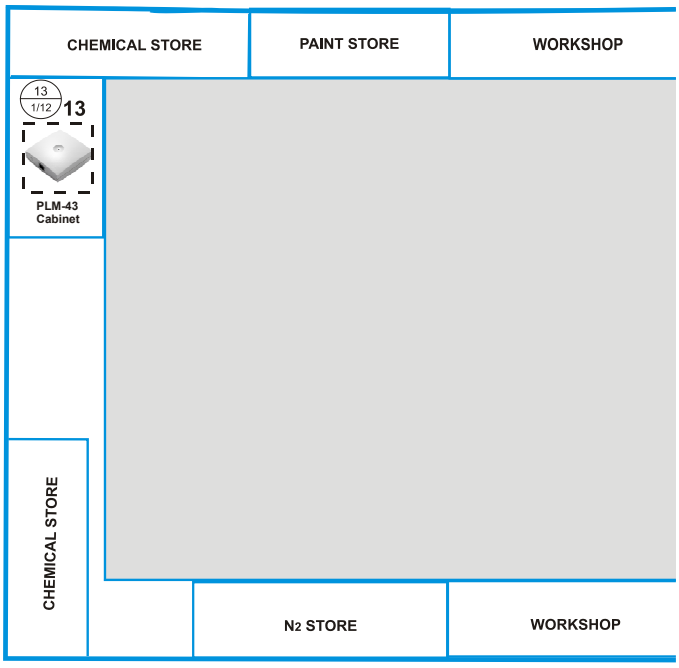


Figure 13 Base station deployment on Aft Main Deck

In the example above, base station 13 is placed high in the cabin area and installed in a plastic water-tight cabinet (type PLM-32 or PLM-43) to shield it from the elements. The standard base station is directed out and down towards the open Main Deck area.

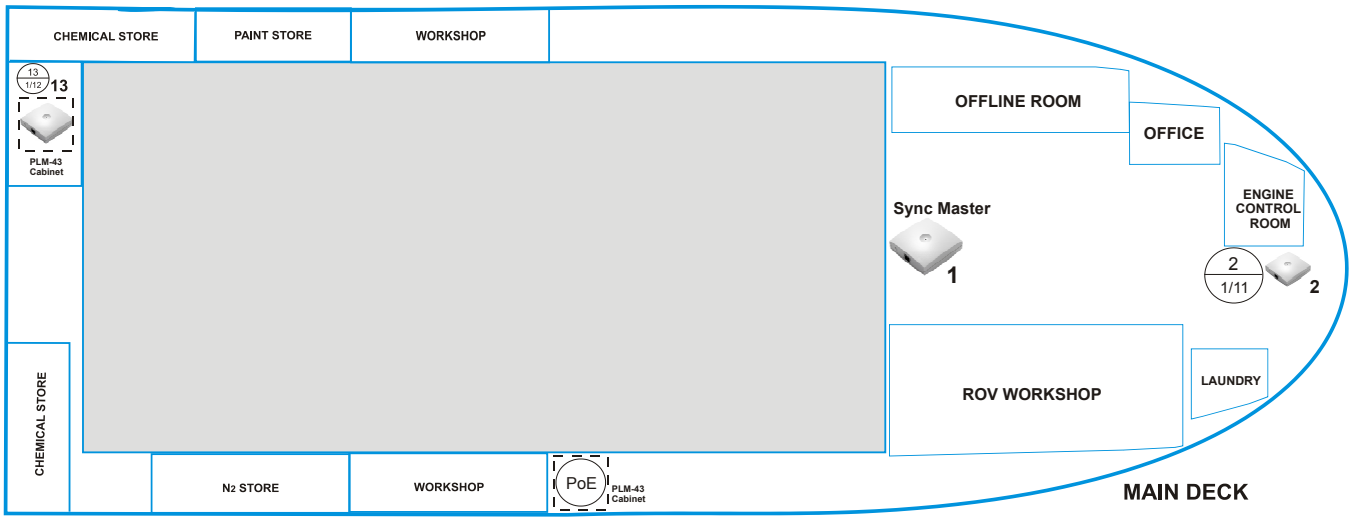


Figure 14 Base station deployment on Main Deck

In the example above, base stations 2 and 13 should be air-synced with the Sync Master (base station 1) in the cabin area which also covers the Main Deck.

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