COBHAM

Network Installation SAILOR AIS, GNSS/DGNSS, Navtex, and Control Panel

Application note

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Network Installation of SAILOR AIS, GNSS/DGNSS, Navtex, and Control Panels

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Scope and Identification

The purpose of this document is to create a baseline for of the SAILOR network solutions in relation to internal and external communication configurations. It explains our recommendations to the use of Ethernet networking between the listed SAILOR devices. The document will be further developed to include Ethernet interfacing to other SAILOR, and 3rd party devices when these solutions become available.

This version of the Application Note covers only the redundant Ethernet network cabling for internal communication between the SAILOR devices identified in the heading of the document. The description of interconnection with 3rd party devices, such as ECDIS, is covered by the individual installation manuals.

The SAILOR 6282 AIS Transponder, SAILOR 6390 Navtex Receiver, SAILOR 6588 GNSS/DGNSS Receiver[1] and SAILOR 6004 Control Panel provide facilities for redundant Ethernet topologies to increase robustness against Ethernet link failures.

In order to keep an installation in compliance with the SOLAS requirements, the product certificates need to be taken into account at all times.

For all other aspects of installation, please refer to the installation manual for each single device.

Revision Information

Date	Change
2015-09-04	1st revision; Agile document number
2015-11-09	2nd revision after 1st internal review
2015-11-11	3rd revision after 2nd internal review

Definitions

CP	SAILOR 6004 Control Panel
RSTP	Rapid Spanning Tree Protocol
TMA	Thrane Link Management Application, runs on Windows PC, download at www.cobham/satcom, Service and support
Priority App	When installing Apps on the SAILOR 6004 Control Panel, you can choose if the app shall be installed as a priority app. On each SAILOR 6004 Control Panel, 2 Apps can select to be priority apps. These apps will be accessible both through the HOME button, and through the quick access buttons in the bottom of the screen
n/a	not applicable

RSTP technology

The SAILOR units described in this document utilize the RSTP technology in their network interfaces. An advantage of the RSTP technology is the redundancy provided. This will in the event of a connection failure,

[1] The SAILOR 6588 GNSS/DGNSS can be configured to either a GNSS or a DGNSS receiver. Standalone, Primary, Secondary and Tertiary (D)GNSS roles can be defined to help the user identify the different redundant (D)GNSS devices in a system of multiple (D)GNSS

automatically activate a reconfiguration of the network within 1-6 seconds (see Figure 5), which typically will allow the connected devices to continue communication without a remarkable interruption of the service.

RSTP requires that a device at minimum has 2 Ethernet ports to connect to other devices.

The RSTP setting must be enabled on all devices in the network.

RSTP in SAILOR products

The following SAILOR products are by default enabled for RSTP and can therefore detect and use redundant Ether-net links:

Device Name	Device Number	Firmware Version	Firmware Version	
SAILOR 6004 Control Panel	TT-6004A	1.33 and later	2.03 and later	*future use*
SAILOR 6282 AIS Transponder	TT-6282A	2.00 and later	2.10 and later	
SAILOR 6390 Navtex Receiver	TT-6390A	1.10 and later	2.00 and later	
SAILOR 6588 GNSS/DGNSS Receiver	TT-6588A	n/a	1.07 and later	

Table 1 required minimum firmware versions for networking devices

Devices not listed, cannot be used in any of the redundant RSTP topologies described below.

Note: Ensure that all devices have at least the required firmware versions. Using devices with older firmware can compromise redundancy, degrade performance of the man-machine interface, and even degrade the function of the SAILOR devices.

Note: Connecting devices not listed to one of the RSTP topologies described can compromise redundancy, degrade performance of the man-machine interface applications, and even degrade the function of the SAILOR devices.

Note: Remember that Ethernet cables only provide redundancy if they are physically separated from each other in the installation.

Recommended Topologies that use RSTP

This chapter lists several topologies for networking the equipment listed in table 1.

Not all listed topologies are SOLAS compliant, see Table 2.

Topology	Character	SOLAS compliant
Topology 1	1 BDU, 1 CP	Yes
Topology 2	2 BDU of different function, 1 CP	No
Topology 3	2 BDU of different function, 2 CP	Yes
Topology 4	3 BDU of different function, 2 CP	No
Topology 5	3 BDU of different function, 3 CP	Yes

Table 2 SOLAS compliant topologies

Note: At present no interface protocol exists for control of the SAILOR BDUs via Ethernet from non-SAILOR control units. Each SAILOR BDU supports several NMEA/UART commands to allow 3rd party equipment such as ECDIS a certain level of control, please see the installation and user manuals for the specific BDU´s.

Topology 1: 2 devices

In this topology, the system will continue to work, even if one of the two cables is accidentally removed or breaks due to mechanical or electrical stress. In the installation the 2 cables are permanently connected between the 2 devices. The order of the ports used does not matter.

The following three figures show the same installation in different conditions:

Figure 1 shows the installation.

Figure 2 a) shows normal operation where both cables are usable and RSTP protocol only utilize Ethernet cable 1.

Figure 2 b) shows that Ethernet cable 1 is detected to fail, and the RSTP protocol utilizes Ethernet cable 2. The transition between the two states happens automatically.

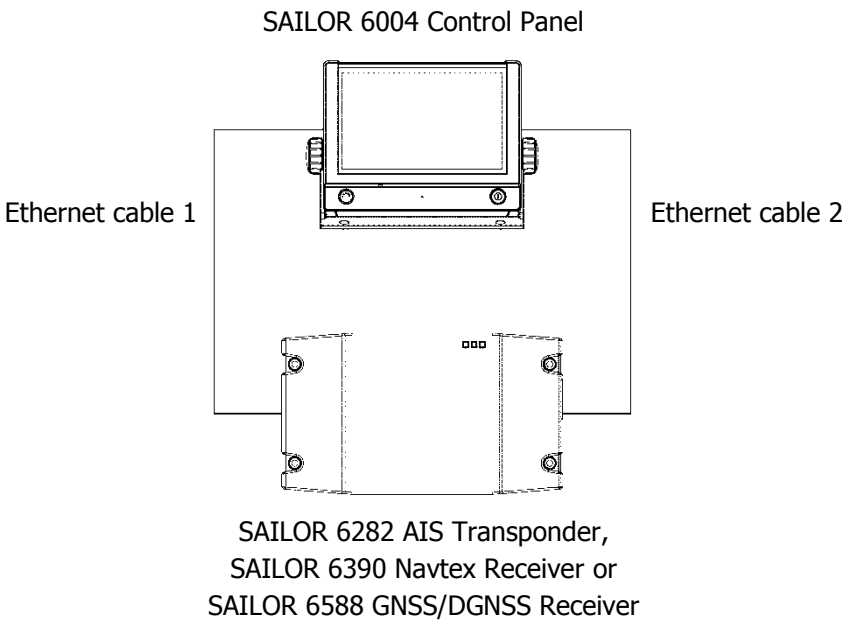

Figure 1 Topology with 2 devices, redundant cabling

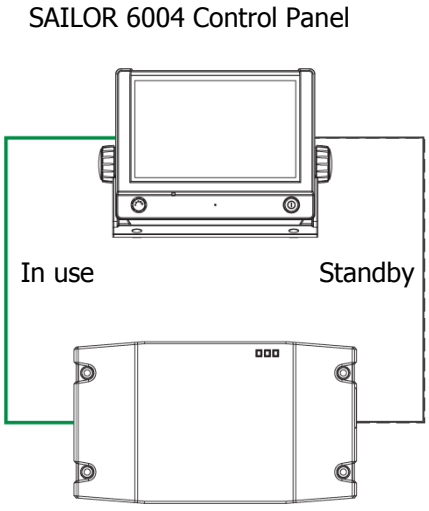

Figure 2 a) Normal operation

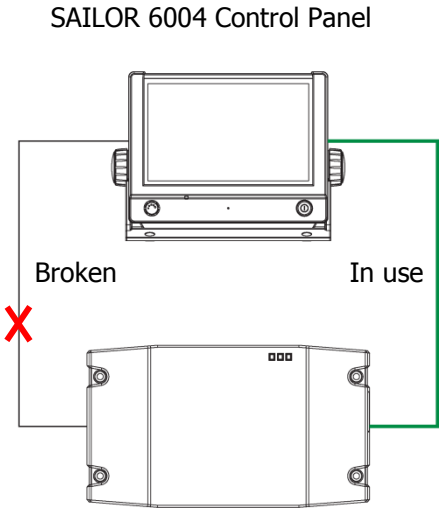

Figure 2 b) Redundancy link in use

Topology 2: AIS, Navtex and 1 Control Panel

In order to have a robust system, 3 cables are used in a ring topology. The connection order is not important. The system will always send packets the most effective way.

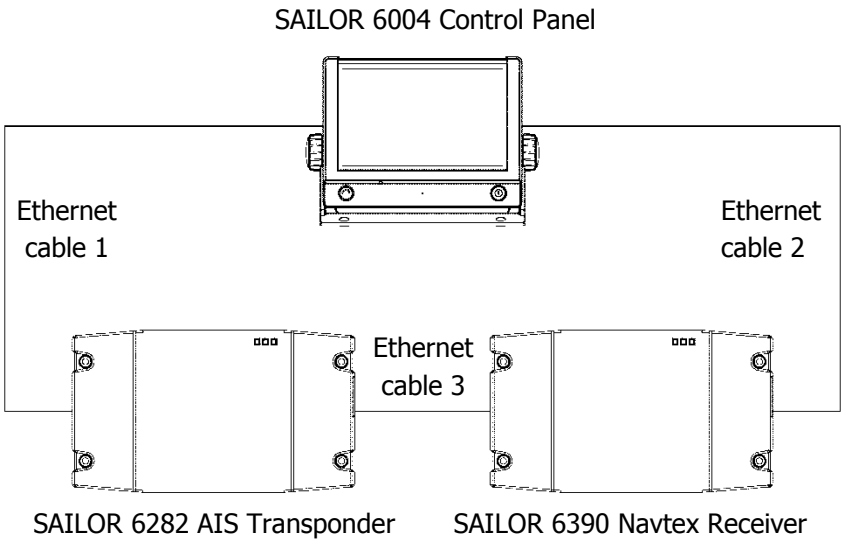

Figure 3 Topology with 3 devices

Note: This topology is not recommended because a failure in the SAILOR 6004 Control Panel will lead to loss of control over both the SAILOR 6282 AIS Transponder and the SAILOR 6390 Navtex Receiver. Topology 3 solves that vulnerability.

Topology 3: AIS, Navtex and 2 Control Panels

In order to have a robust system 4 cables are used in a ring topology. The connection order is important for cases where more than 1 connection breaks.

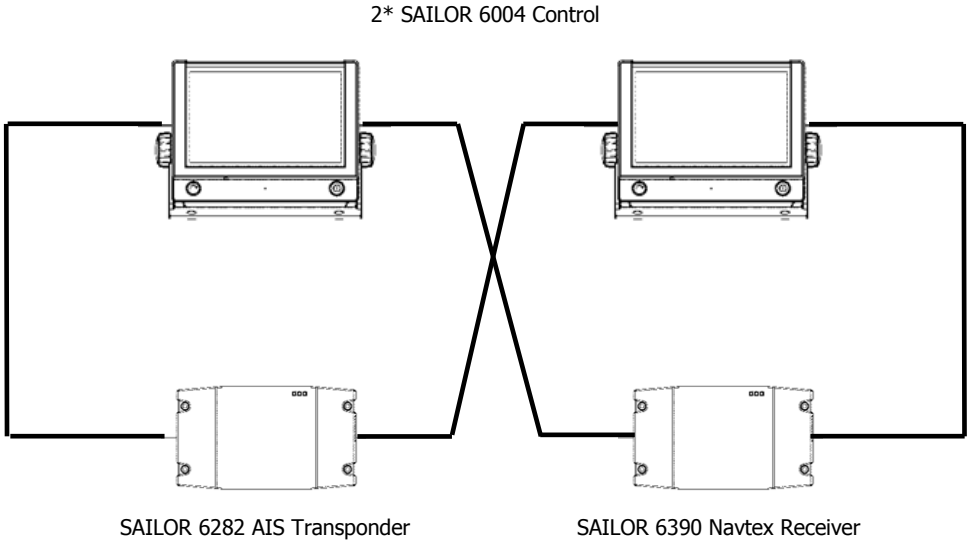

Figure 4: Ring topology with 4 devices

Topology 4: AIS, Navtex, 3 DGNSS and 2 Control Panels

In order to have a robust system, 7 cables are used in a ring topology. The connection order is important for cases where more than 1 connection breaks.

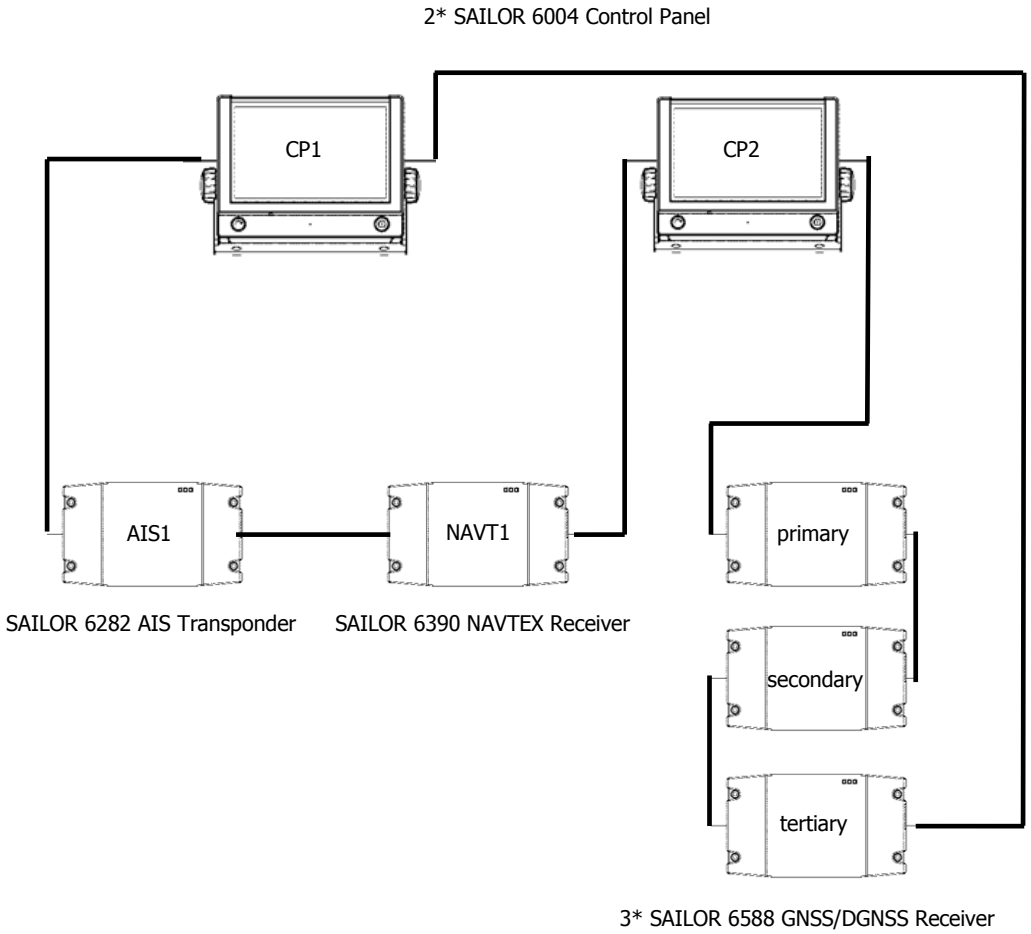

Figure 5: Ring topology with 7 devices.

Installation of applications on the SAILOR 6004 control panels is recommended as follows:

App from device	Installed on CP1	Installed on CP2
AIS	Yes, priority App	Yes
Navtex	Yes, priority App	Yes
Primary GNSS/DGNSS	Yes	Yes, priority App
Secondary GNSS/DGNSS	Yes	Yes, priority App
Tertiary GNSS/DGNSS	Yes	Yes

Table 3: Recommended installation of applications for Topology 4

Topology 5: AIS, Navtex, 3 DGNSS and 3 Control Panels

In order to have a robust system, 7 cables are connected in a ring topology. The connection order is important for cases where more than 1 connection breaks.

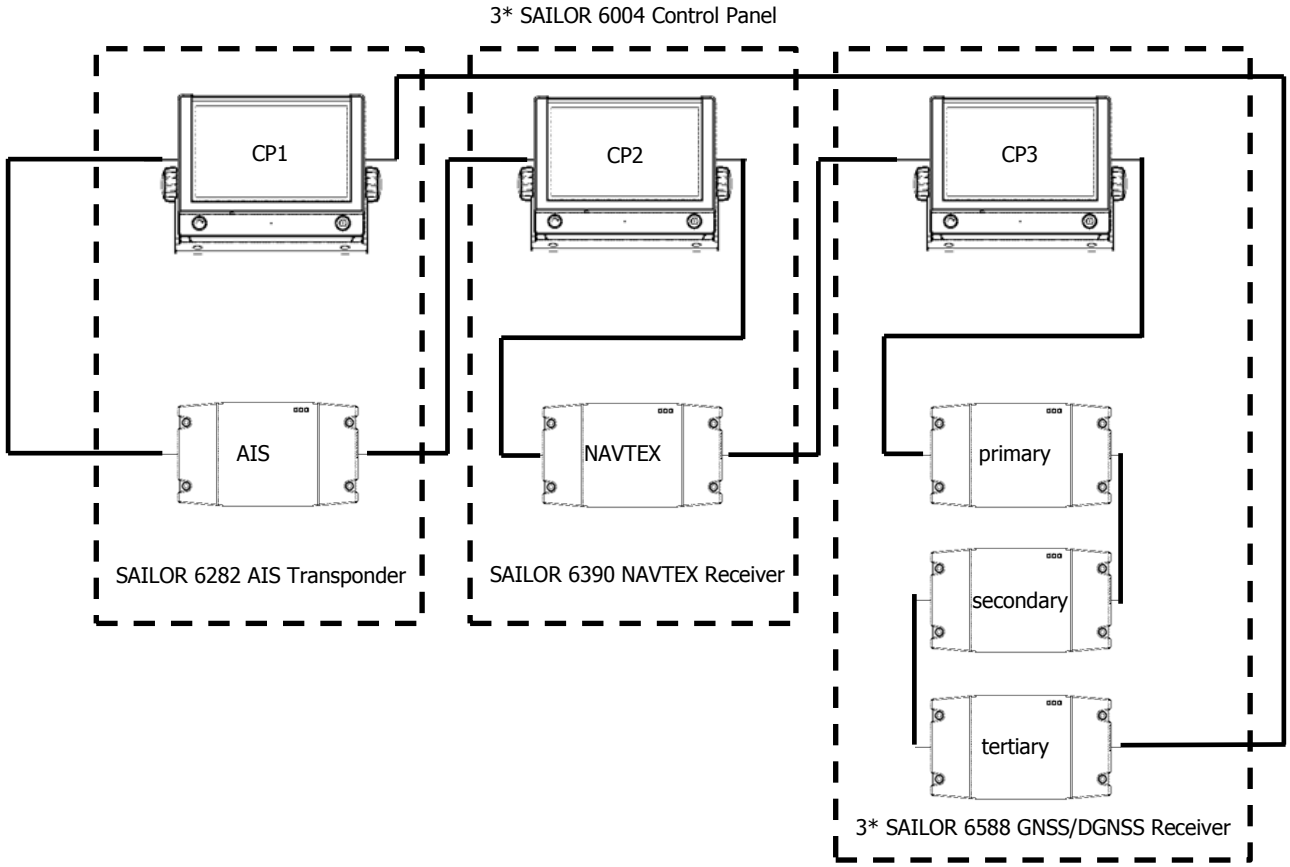

Figure 6: Ring topology with 8 devices.

Installation of applications on the SAILOR 6004 control panels is recommended as follows:

App from device	Installed on CP1	Installed on CP2	Installed on CP3
AIS	Yes, priority App	Yes	Yes
Navtex	Yes	Yes, priority App	Yes
Primary GNSS/DGNSS	Yes	Yes	Yes, priority App
Secondary GNSS/DGNSS	Yes	Yes	Yes, priority App
Tertiary GNSS/DGNSS	Yes	Yes	Yes

Table 4: Recommended installation of applications for Topology 5

Test and Maintenance

Connection of a Service PC

In order to connect your Service PC to the system, you need to unplug one cable from one device and plug it into your PC, as shown in figure 8.

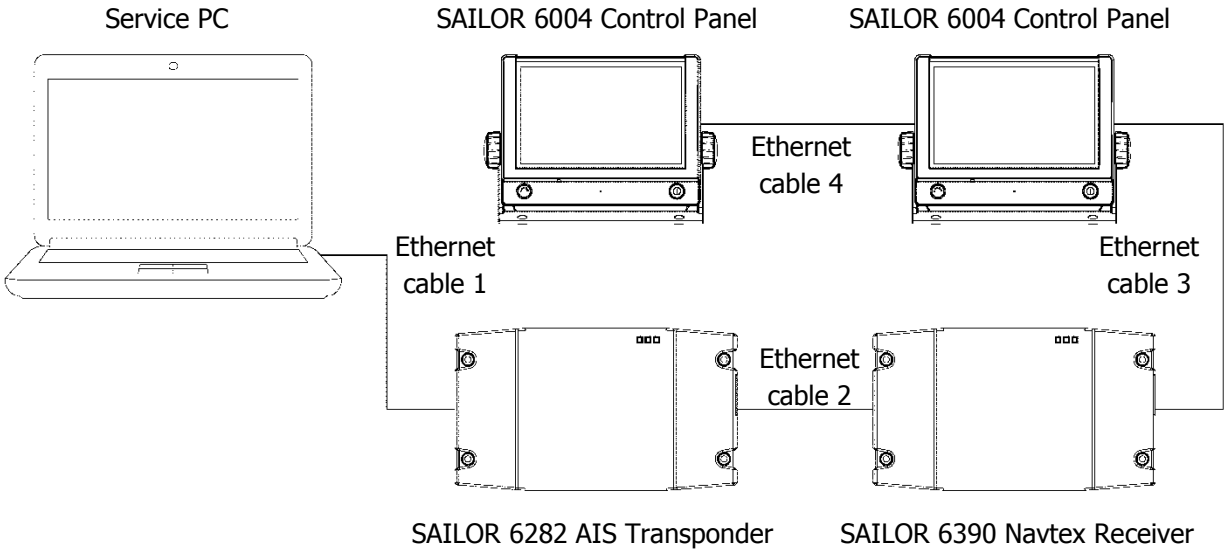

Figure 7 How to connect a Service PC – applicable to all topologies

Initial setup of the system

1. Check correct firmware version of each device: Use your service PC and the TMA application. In case of available firmware upgrades: perform the firmware upgrade before establishing the ring topology.
2. Install the devices into the chosen topology and connect all cables.
3. Install the MMI Applications for AIS, GNSS/DGNSS and/or Navtex in the control panels as described in the user manuals.

Testing the system redundancy

4. Open the MMI Applications for Navtex and/or AIS to check for errors or misconfigurations.
5. When in error-free state, disconnect one end of any of the Ethernet cables in the ring and make sure that no "connection lost" type of error appears on any of the control panels for AIS, GNSS/DGNSS or Navtex.
6. Reconnect the cable and redo the check for "connection lost" type of error (step 4.).
7. Repeat steps 5) and 6) for each of the Ethernet cables in the ring.
8. During the whole procedure, no "connection lost" type of error should occur on any control panel.
9. When disconnecting two Ethernet cable in the ring, at least one Control Panel shall show an error.

Troubleshooting

If the test of the system reveals a "connection lost" type of error when one of Ethernet link connection cables is disconnected: one or more of the other Ethernet link cables suffer from a failure.

If only one Ethernet link cable suffers from malfunction, the system will still function without alarm, because RSTP avoids using the defect cable. In this condition a "connection lost" alarm will be trigged if additionally one of the remaining functioning cables is removed. Therefore, the defective cable is the one you can remove from the system without triggering a "connection lost" type of alarm.

If several Ethernet link cables suffer from malfunction, you have to repeat test steps 5-8 for all cables until no "connection lost" type of error is shown.

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