OPERATING INSTRUCTIONS

# NAV-LOC, SIM2000, NAV245

## Laser positioning system

SICK
Sensor Intelligence.


### Product described

NAV-LOC with NAV245

### Manufacturer

SICK AG
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### Legal notes



### Original document

This document is an original document of SICK AG.

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# Contents

# 1 Purpose of this document

The NAV-LOC consists of one 2D LiDAR sensor and one SIM2000-0A20A00.

Operation of the SIM2000-0A20A00 and its connection and integration in a vehicle are described in document 8021385 (German) and document 8021386 (English).

The purpose of this document is to explain the special features that must be considered in terms of voltage supply, interfacing, and synchronization when using a NAV245.

# 2 Product description

## 2.1 Scope of delivery

The NAV-LOC with a NAV245 is available in a range of variants depending on the requirements:

| Variant | Description |  NAV245 |  SIM2000 + Application Navigation Control |  Scan Data Recording |  Map Service |
|---|---|---|---|---|---|
| NAV-LOC | New Project | ✓ | ✓ | ✓ | ✓ |
| Option 1 | Extension of Project (additional AGV) | ✓ | ✓ | | |
| Option 2 | Change to NAV-LOC (NAV245 existing) | | ✓ | ✓ | ✓ |
| Option 3 | Retrofit NAV-LOC (NAV245 existing, Map in operation) | | ✓ | | |
| Option 4 | Map Update / extension (due to change of factory) | | | ✓ | ✓ |

The delivery of the NAV-LOC includes the following components:

| No. of units | Component |
|---|---|
| 1 | NAV245-10100 laser position sensor |
| 1 | SIM2000-0A20A00 including “navigation control” application |

Please note: Cables for the voltage supply and data lines are not included with delivery and can optionally be ordered as accessories.

**Sources for obtaining more information**

Additional information about the SIM2000-0A20A00 and its optional accessories can be found in the following places:

- Operating instructions of the SIM2000-0A20A00 online at www.sick.com and input of the part number in the search field: 8020763 (German) or 8020764 (English).
- (www.sick.com) for detailed technical data (online data sheet)

## 2.2 NAV245 2D-LiDAR sensor

Additional information on the NAV245 with notes on mounting, installation, and commissioning can be found online in the operating instructions (SICK document no.: 8018477 (German) and 8018478 (English)) and in the additional information on the product page of the NAV245 (www.sick.com).

You can find technical information for NAV245 general telegrams in CoLa A/B format under part number 8014631 and for the special landmark Cola A/B protocol under part number 8018823.

# 3 Installation and alignment

The NAV245 should be installed according to the description in the operating instructions (see document at: www.sick.com/NAV245).

It should be possible to tilt the scanner in all directions in order to be able to align the scanner horizontally so that the scan plane of the sensor runs parallel to the floor surface.

The sensor must be fixed to a vehicle so that the alignment of the sensor cannot be changed on accident.

The sensor must be mounted in such a way that the contour of the vehicle itself is not within the measurement area of the LiDAR sensor.

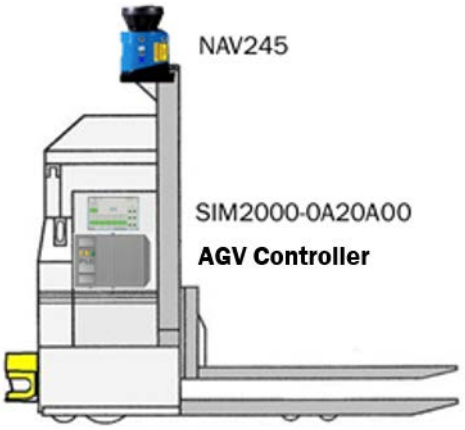
Ideally, alignment is done in an area with an even floor area intended for service work.

Alignment, at least, should be carried out with a spirit level, which can be placed on the motor crown.

Use the scan visualization in SOPAS ET to verify the generated measured values and the measuring range online.

1. Select NAV245, MONITOR, SCAN DISPLAY in the project tree.
2. To start the measurement, click the PLAY button.
3. Compare the measurement line with the required result.

**Important!** The SCAN VIEW on the MONITOR depends on the available processing power of the PC and is not output in real time. For this reason not all measured values are displayed.




*Typical installation of the NAV-LOC on an AGV*

**Note:** See chapter 4, Alignment of the scan plane, of the operating instructions (SICK document no. 8018477 (German) and 8018478 (English)) for detailed instructions on how to optimally align the NAV245.

# 4 Initial commissioning and demonstration

## 4.1 Establishment of connections

The connection of the voltage supply for the SIM2000-0A20A00 is described in chapter 7.3 of the NAV-LOC operating instructions.

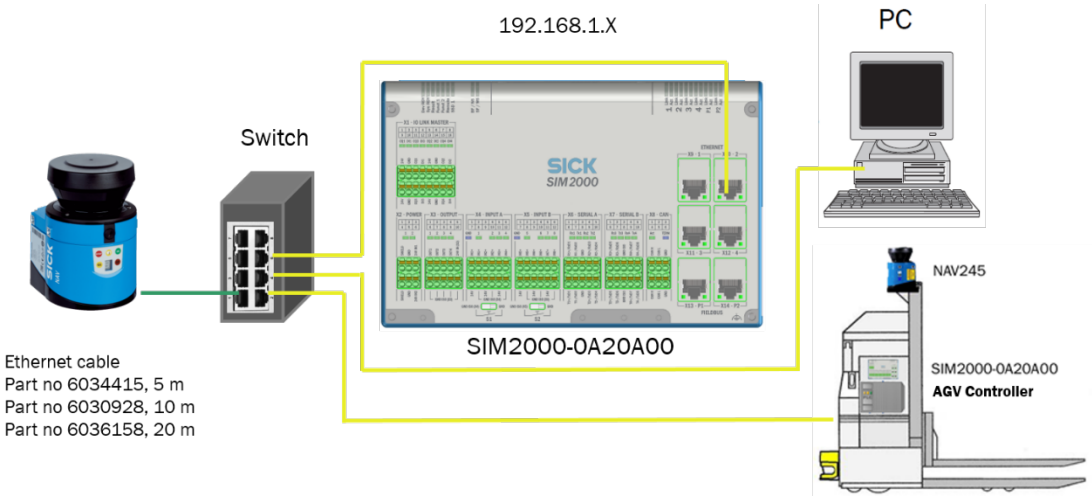
The Ethernet interface of the SIM can be used for direct connection of the scanner and the PC.

The connection variant for vehicle integration using a switch is described in chapter 5.

The connections shown here are based on the default settings of the SIM (192.168.0.1) and the NAV245 (192.168.1.10).

**Warning:** When delivered, the NAV245 is set to address 192.168.0.1 and must be changed to the address 192.168.1.10 using SOPAS ET.

The Ethernet interface of the PC is set to an IP address in the range 192.168.0.2 to 192.168.0.255 in this case.



# 5 Integration and commissioning of the NAV-LOC in a vehicle

## 5.1 Connecting the NAV245 voltage supply

Connecting the voltage supply for the NAV245 is described in detail in the operating instructions (8018477) in chapter 5. Here is a short summary:

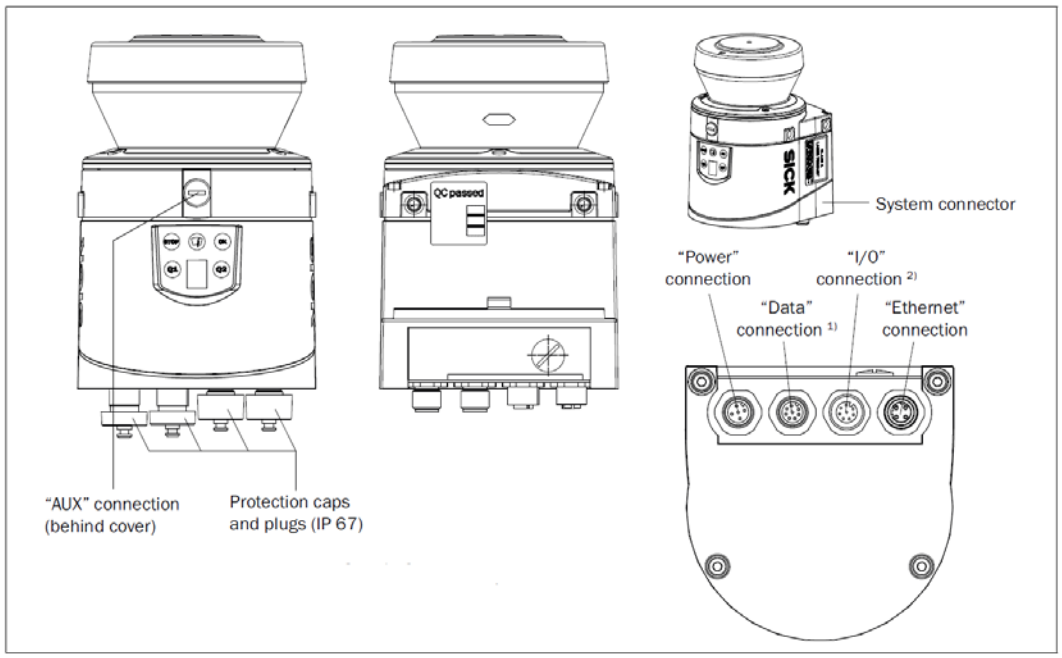
Supply voltage:

10.8 ... 30 V DC according to IEC 60364-4-41

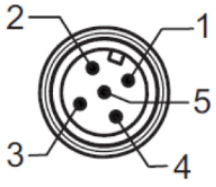
(observe permissible lengths of cable in chapter 6.3.2, table 11 on page 56 of the 8018477 manual)

The NAV245 consumes the following:

- Power consumption with maximum output load of 20 W
- Power consumption with maximum heating power of 60 W

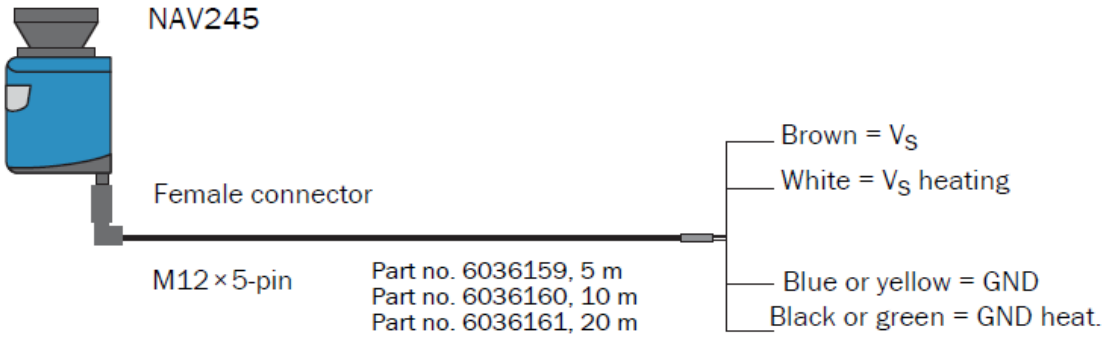



*Position of the electrical connections*




| Pin | Signal | Function |
|---|---|---|
| 1 | $V_S$ | Supply voltage NAV245 |
| 2 | $V_S$ heat | Heating supply voltage |
| 3 | GND | Ground |
| 4 | - | Not assigned |
| 5 | GND heat | Ground for heating |

*Pin assignment of the "Power" connection M12x5, male connector on the NAV245*




Pre-assembled cables with open ends are available to supply the NAV245.

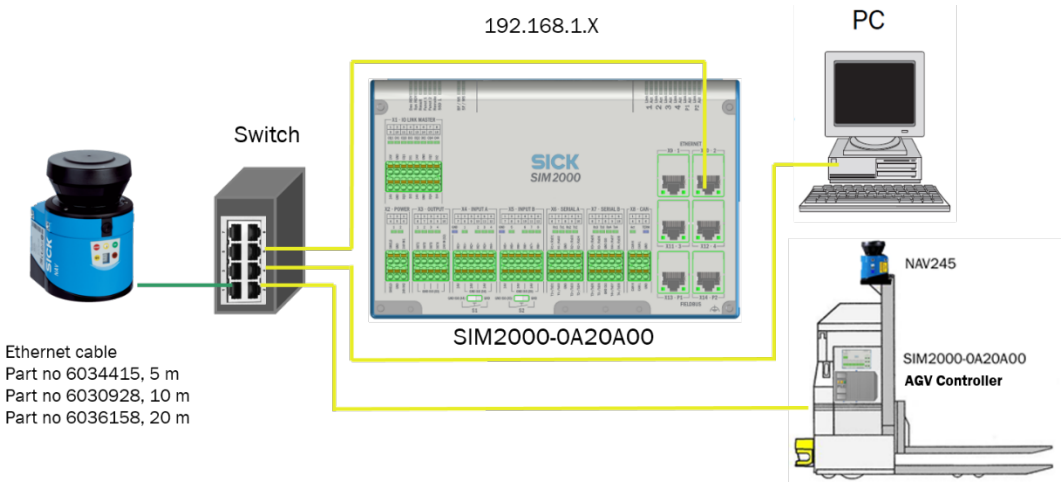
Important:
For connecting cables with part no. 6036159, part no. 6036160, and part no. 6036161, the GND and GND heat. cables are either blue and black or yellow and green.

## 5.2 Connecting the components with connection to the network in the AGV using a switch

The vehicle control must have at least one Ethernet interface in order to communicate with the NAV-LOC.

When using a switch, all components must be set in the same IP number range or a DHCP server must be available. In this configuration, access is possible from the PC and vehicle computer to the SIM and the laser scanner.

**Warning:** When delivered, the NAV245 is set to address 192.168.0.1 and must be changed to the address 192.168.1.2, for example, using SOPAS ET.




*Integrating the NAV-LOC into an AGV*

## 5.3 Synchronization of the NAV245 2D LiDAR sensor with the navigation control

The navigation control synchronizes with the timer of the connected NAV245 scanner for precise assignment of the current scan.

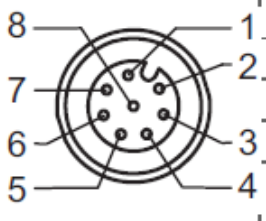
The synchronization described below is essential for trouble-free operation.

The NAV245 outputs a signal depending on the position of the scanner head.

This signal is used to synchronize the scans and balance out different run times via the Ethernet interface.

This pulse is output at the time of the first measuring point (-45°) and corresponds to the start-of-scan time stamp in the measurement data.

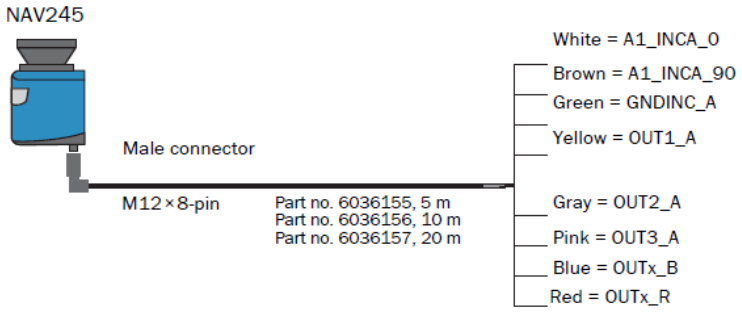
A pulse on pin 4 (OUT1_A output 1) at the I/O output of the NAV245 is selected for synchronization.




| Pin | Signal | Function |
|---|---|---|
| 1 | A1_INCA_0 | Encoder input 1 |
| 2 | A1_INCA_90 | Encoder input 2 |
| 3 | GNDINC_A | Ground for encoder inputs |
| 4 | OUT1_A | Digital output 1 |
| 5 | OUT2_A | Digital output 2 |
| 6 | OUT3_A | Digital output 3 |
| 7 | OUTx_B | Second connection for digital outputs 1 to 3 |
| 8 | OUTx_R | Resistance-monitored connection for digital outputs 1 to 3 |

*Pin assignment of the "I/O" connection on the NAV245*

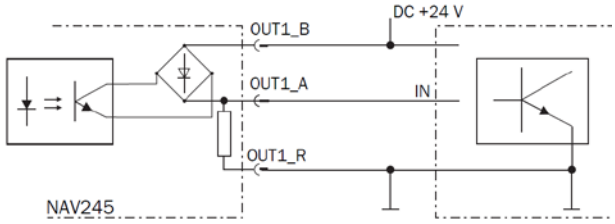
In order to access this pin, an 8-wire cable, such as with part number 6036155 (5 m length, open ends) must be used without fail; it can be shortened if necessary.




*"I/O" connecting cables for the NAV245*

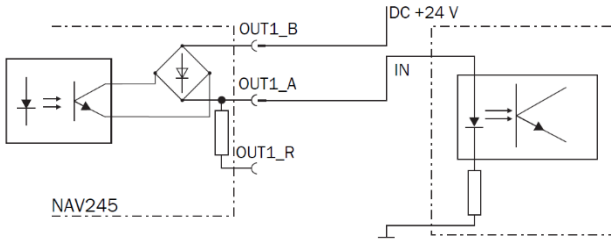
The sync output must be connected **active high** and there are two connection options for this:

**Connecting the NAV245 outputs non-floating (active high)**




*Connecting the outputs to a PLC, non-floating (active high)*

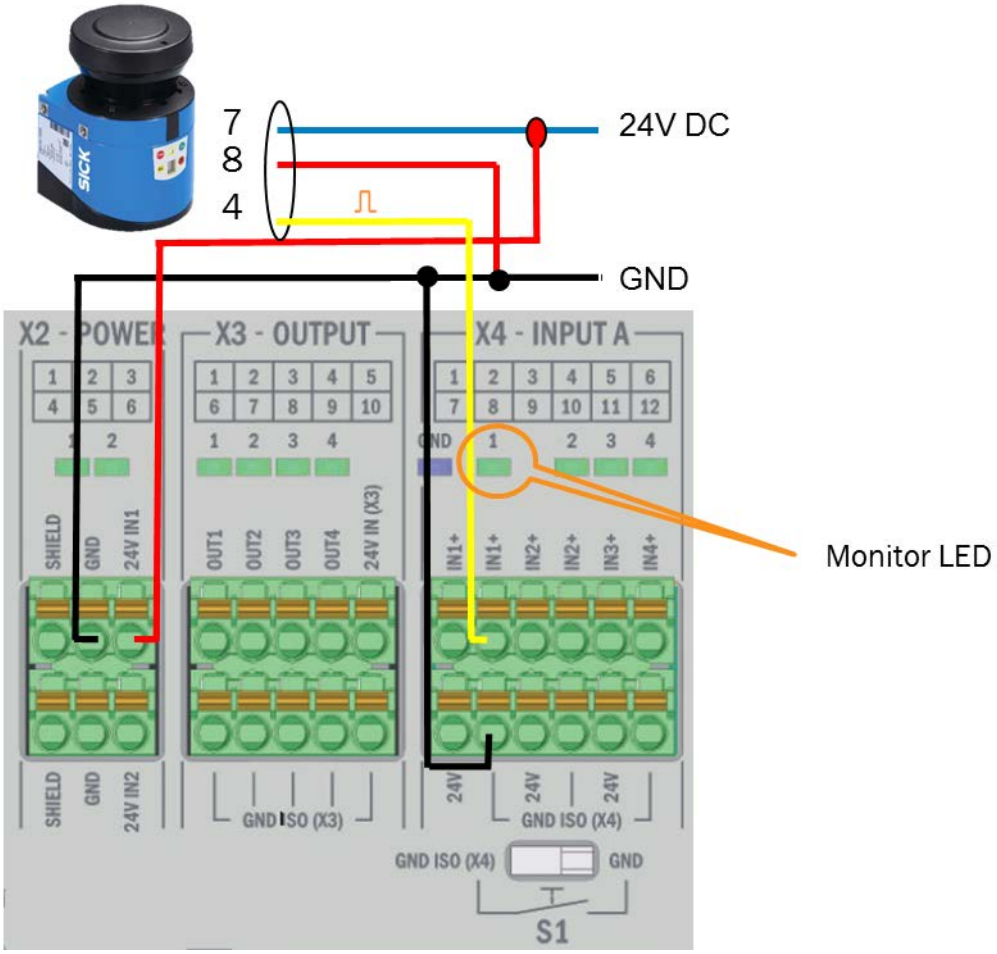
**Connecting the NAV245 outputs volt-free (active high)**




*Connecting the outputs to a PLC, volt-free (active high)*

**NOTE**

For navigation control to be able to evaluate the hardware signal of the scanner, it is important to connect switching output OUT 1 from the scanner, which is available on the yellow wire of the 8-pin supply cable, to input X4-1 (IN1+) of the SIM.




*Wiring example of a joint voltage supply of the SIM2000-0A20A00 and NAV245*

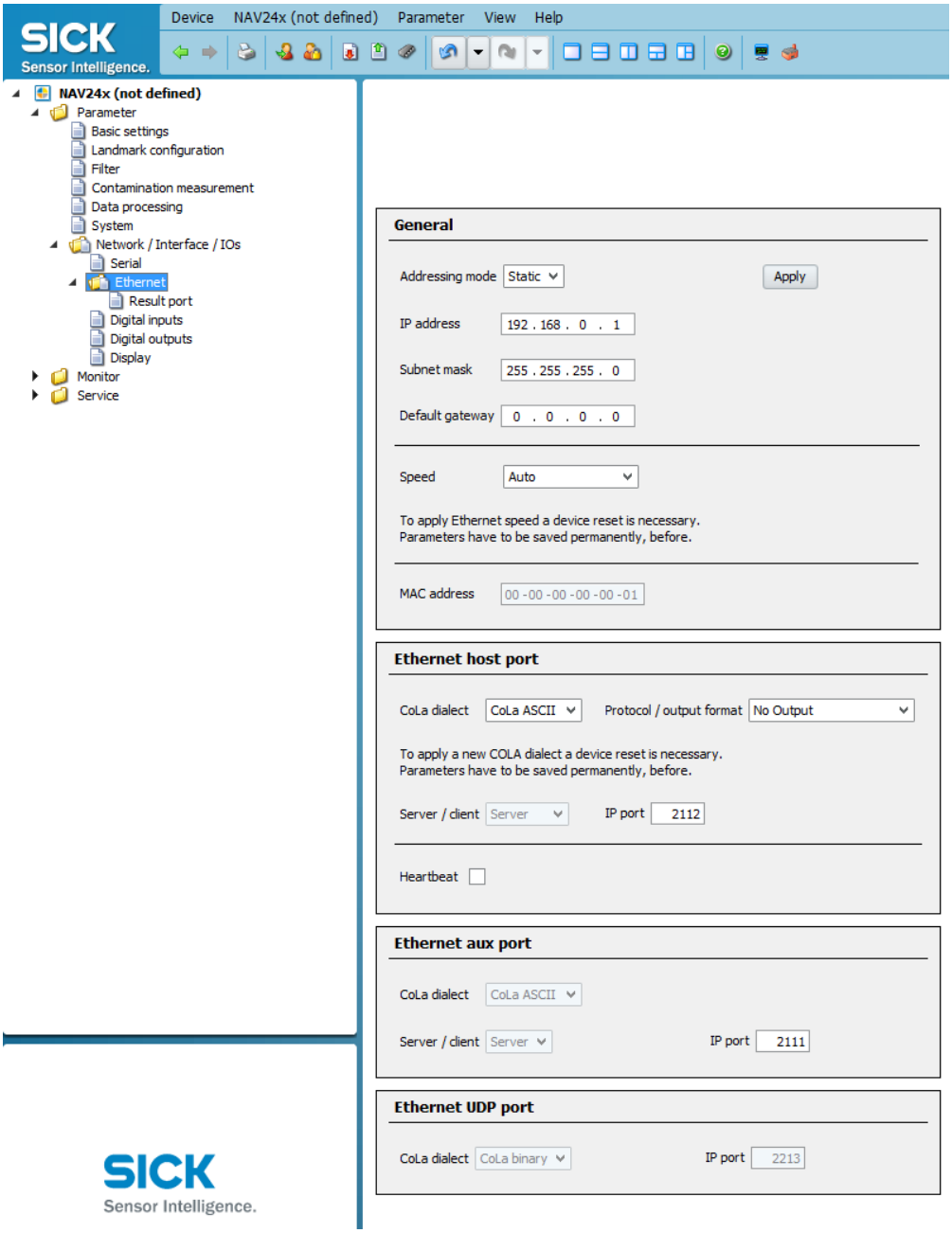
**NOTE**

Monitor LED 1 sends a signal when sync signals are received by the connected scanner.

# 6 Setup of the NAV245

The IP address of the scanner must be tested and, if necessary, set to an appropriate address for communication between the SIM and the NAV245.

The default setting of the NAV245 is 192.168.0.1 and can be changed by the SOPAS ET configuration program if necessary.




*Configuration of the Ethernet interface scanner*

8023452/en/2018-08-09

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