

SYMEO LOCAL POSITIONING RADAR



Product: LPR-1DHP

Product Documentation



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HISTORY

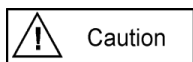
Version	Date	Description
1.10	06.02.2012	Documentation for FCC

SYMBOLS USED

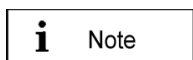
The following symbols are used throughout the documentation:



This symbol appears before instructions that must be followed at all times. Failure to comply with these instructions will result in personal injury.



This symbol appears before instructions that must be followed at all times. Failure to comply with these instructions will result in damage to equipment.



This symbol appears before information of particular importance.

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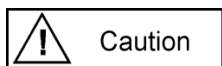
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1 Overview Safety

1.1 Safety Instructions



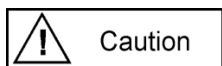
LPR systems are purely tracking and assistance systems. They therefore do not satisfy the safety class 3 requirements and must not be used as standalone systems in safety-critical applications, such as automation or anti-collision.



Follow the safety instructions in the operating instructions for the device and the additional documentation!

Keep these safety instructions and other documents together with the device.

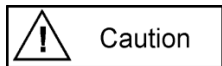
1.2 Installation



All installation, repair and servicing work must be carried out by qualified and trained technicians!

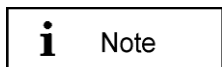
When the system is mounted on fixed tubes the necessary measures to prevent slippage of the system must be taken

1.3 Repairs



Repairs of the device must be carried out by authorized technicians. Unauthorized opening and incorrect repairs could result in severe danger to the user (danger of electric shock, radiated energy, fire hazard).

1.4 Transport and Storage



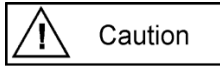
Use the original packaging or other suitable packaging for returns and whenever the system is to be transported. This ensures protection from crushing, impacts, moisture and electrostatic discharge.

During setup and before operation, refer to the instructions for environmental conditions included in the operating instructions for the device.

Route the wires in such a way that they do not cause a hazard and are not damaged. When connecting the wires, refer to the corresponding instructions in the operating instructions for the device.

Do not drop the device and do not expose it to strong vibrations.

1.5 Power Supply



A safety-inspected power cable that satisfies the regulations of the country of use is required for the device. Devices with metal housings must only be connected to a grounded, shock proof socket.

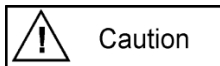
The device must not be operated unless the nominal voltage of the device matches the local supply voltage. Check the supply voltage of the device in stationary devices.

When connecting and disconnecting wires, refer to the instructions in the operating instructions for the device.

Do not use any damaged wires (damaged insulation, exposed wires). A faulty wire poses a risk of electric shock or fire hazard.

Polarity reversal or otherwise faulty connection can damage the LPR-1DHP station. In that case the station must be send to the SYMEO service.

1.6 Setup and Operation



During installation, make sure that no objects or fluids enter the device (risk of electric shock, short circuit).

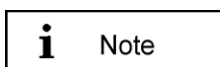
In emergencies (e. g. if there is damage to the housing, control elements or the mains cable, if fluids or foreign bodies have infiltrated the equipment), switch off the power supply to the device immediately and notify your SYMEO Service.

Protect the contacts of all of the device's sockets and plugs from static electricity. Do not touch the contacts. If it is ever necessary to touch the contacts, take the following precautionary measures: Touch a grounded object or carry a ground strap before touching the contacts. This will divert static charges.

Proper operation (in accordance with IEC60950/EN60950) of the device is only assured if the housing and integral covers for mounting slots are fully installed (electric shock, cooling, fire protection, noise suppression). If necessary, refer to the corresponding instructions in the operating instructions for the device.

In the case of high outside temperatures and intense, direct solar radiation or other radiant heat, it may be necessary to provide a sun or heat shield.

1.7 System Extensions and Accessories



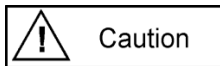
Data links to peripheral devices must be provided with adequate shielding.

For LAN cabling, the requirements in accordance with EN 50173 and EN 50174-1/2 apply. Use of either a Category 5 shielded cable for 10/100 Ethernet or Category 5e shielded cable for gigabit Ethernet is a minimum requirement. The specifications of standard ISO/IEC 11801

must be complied with.

The warranty shall be voided if you cause defects to the device by installing or exchanging system extensions.

1.8 Additional Instructions Regarding LPR-1DHP station



The LPR 1 DHP station must not be opened except for installation and mounting. The LPR 1DHP station contains no serviceable components.

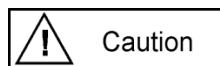
When opening, ensure that no fluid gets into the housing. When sealing the station, ensure that the seal is included in the rear element and that the LPR 1 DHP station is completely closed. Otherwise, moisture can penetrate the station and damage it.

In order to install the LPR 1DHP station, the rear element must be detached from the front element. Refer also to the instructions on installing the station.

The printed circuit board stack connected to the front element does not require user service and must remain attached to the front element.

Please take note of the safety and operating instructions in the operating instructions for the system in which you want to install the component.

1.9 Important Information to User



Any change or modification not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

2 Overview of the LPR-1DHP system

An LPR-1DHP system consists of two units named BS and TS that conduct the measurements. One unit (BS) initiates the measurement and the second unit (TS) replies. Both units are shipped in a pre-configured set. Unit BS1 is configured to measure with TS1, BS2 with TS2 and so on. The distance values are only available on the unit labeled BS. Consequently, the unit BS must be mounted at the position where the distance values are required, e.g. on the crane-bridge. Figure 1 shows the complete system including mounting bracket for mounting on tubes.

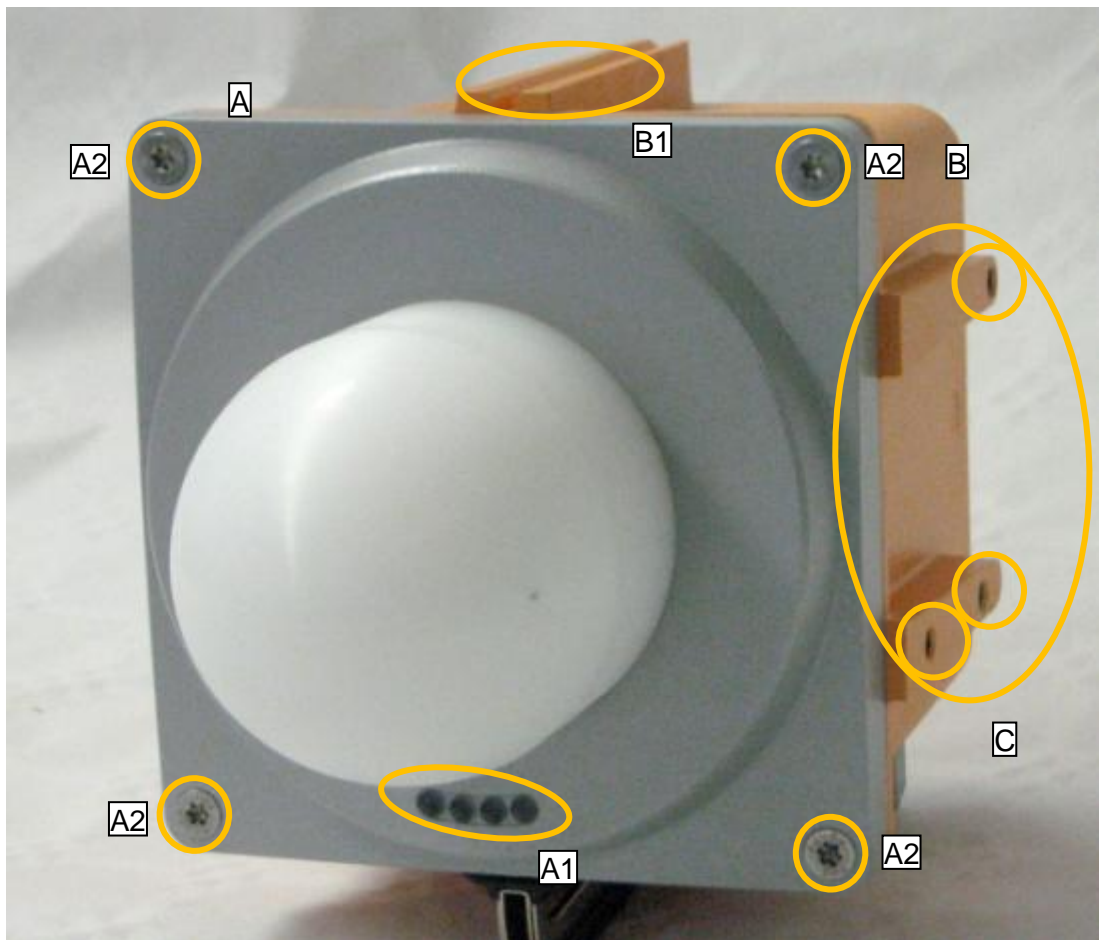


Figure 1: LPR 1DHP station consisting of
 A: Front element with display (A1) and fixing screws for front element (A2)
 B: Rear element with alignment aid (B1)
 C: Holes for mounting bracket.

2.1 Data sheet of LPR-1DHP Station

Overview: Technical Data	
Frequency range	61.000 MHz - 61.500 MHz
Transmitting power	20dBm EIRP
Measuring distance	up to 500 m ^{*1}
Typical accuracy	Up to ± 1 cm ^{*1}
Repeat rate	Max. 25 Hz
Power supply	10-36 V DC
Power consumption	Max. 15 W
Ambient temperature	-40°C to +75°C
Protection class	IP 65 with suitable cables (round, outside diameter 4.5 – 10 mm)
Casing dimensions(LxWxH);	205 x 140 x 140 mm
Weight	0,9kg
Hardware Interface	Ethernet TCP/IP or UDP USB (Configuration)
Data interface	Symeo LPR-1D protocol
Antenna	integrated
Compliance	FCC (Part 15.255)

^{*1} Depending on the application conditions

2.2 Opening angle LPR-1DHP station

The LPR-1DHP station has an integrated antenna with +/-2° opening angle.

LPR 1DHP Station

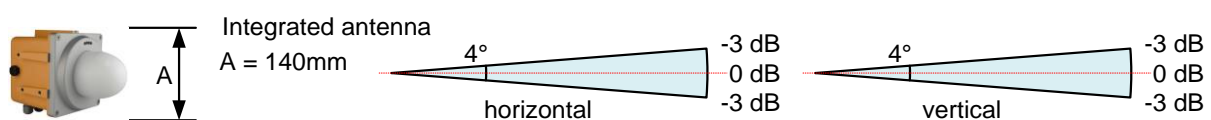
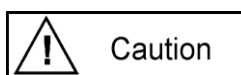


Figure 2: Opening angle LPR 1DHP station



Caution

To achieve operation and range as specified both system units must have the same orientation, e.g. LED display oriented towards the roof or the same wall.

2.3 Mounting position of the LPR-1DHP stations

The stations must be aligned with each other for proper measurement. In addition the following topics must be considered:

- Site-specific mounting instructions must be followed when available.
- A minimum distance of 2 meters between the two system units must be maintained to guarantee the specified accuracy.
- Minimum distance of 50 cm between adjacent systems must be used to avoid cross-interference.
- The two system units must be mounted opposite to each other with less than 10 cm horizontal or vertical offset.
- The stations must be aligned with an accuracy better than $\pm 2^\circ$.
- The orientation of the stations must be the same, e.g. both units with LED-display oriented to the roof or to the same wall.

3 Component setup of the LPR-1DHP station

3.1 Overview

The LPR-1DHP station consists of front element A, rear element B and mounting bracket C as shown in Figure 3.

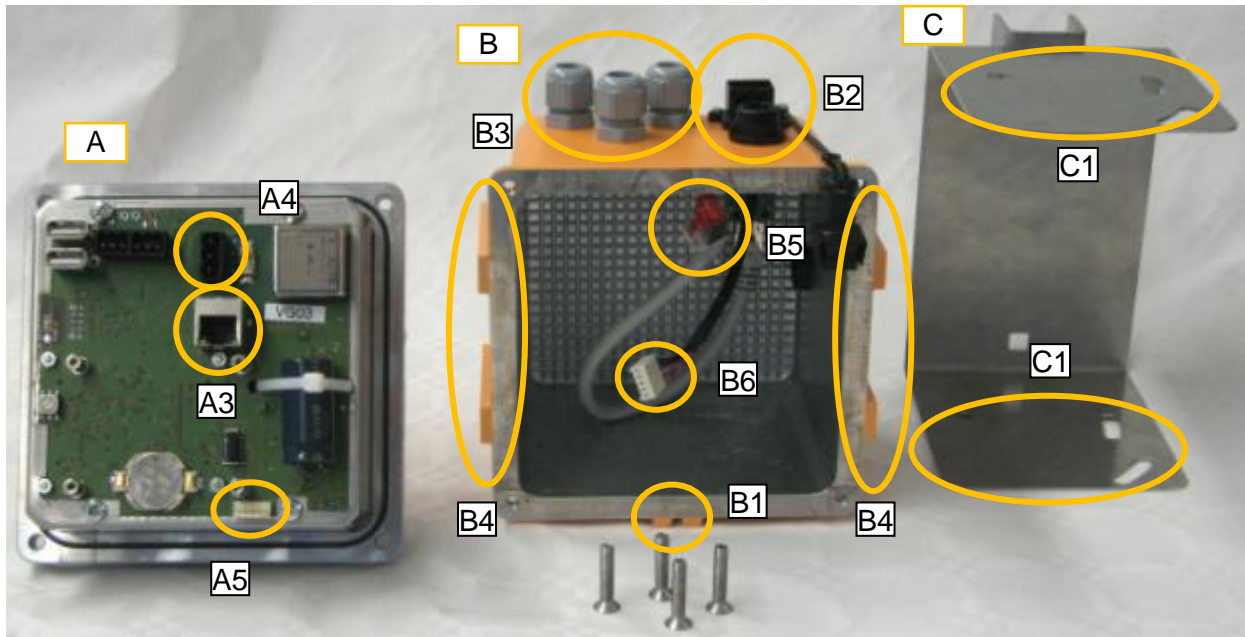


Figure 3: System components front element A, rear element B and mounting bracket C

- A: front element
 - A3 ethernet connector (version TCP/IP)
 - A4 terminal for power connection
 - A5 header for USB cable
- B: rear element
 - B1 alignment aid
 - B2 ethernet connector system (version TCP/IP)
 - B3 cable feedthrough for power supply and auxiliary cables
 - B4 insert nut M6 for mounting the system in the mounting bracket
 - B5 ethernet connector front to rear element (version TCP/IP)
 - B6 USB connector for USB service port
- C: mounting bracket
 - C1 mounting slots for system unit

Important parts not shown in Figure 3 like the LED display (A1) are displayed in Figure 1.

3.2 Front element

The front element is composed of the following parts:

- RF-support element, RF-board, IF-board, power supply and dielectric lens
- Support element with housing screws (A2, see Figure 1)
- Supply board including power supply terminal (A4), ethernet connector (A3) and USB connector (A5)
- LED display (A1, see Figure 1)

3.2.1 LED display

The LEDs on the operating display indicate different statuses of the device as follows:

- When the system is powered, the **red** LED is turned on.
- When both units are connected to the supply power and valid measurements are made the **green** LED is turned on or blinking with low frequency.
- Network traffic is indicated with the **orange** LED for a station with TCP/IP interface

3.2.2 Other parts

The only parts that are important for mounting and commissioning are the housing screws (A2), the terminal for the power supply (A4), the ethernet connector (A3) for version TCP/IP and the USB header (A5). The seal (A8) seals front and rear element when the system is mounted correctly.

Replace the fuse (A9) only with a fuse of the same type and rating (3A normal blow).

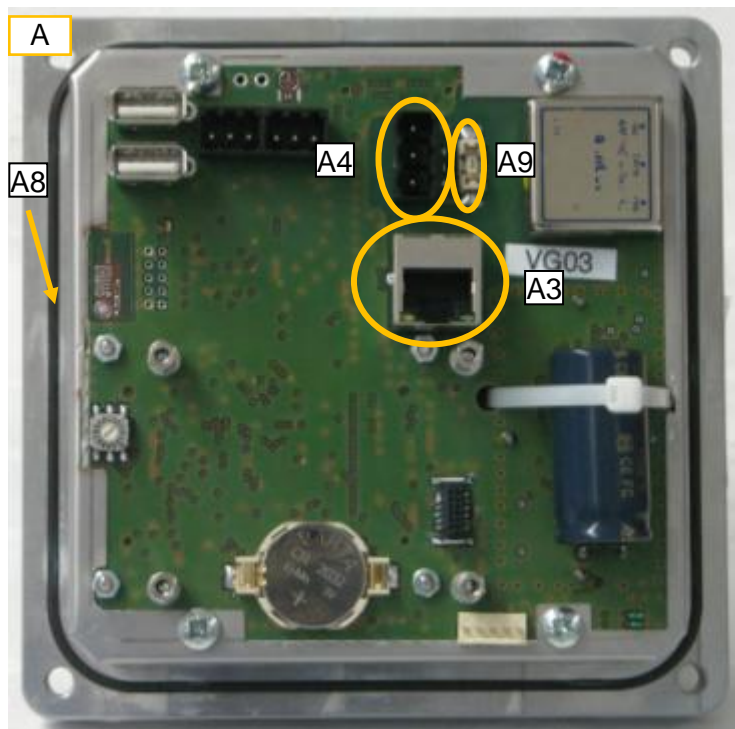


Figure 4: Front element of the LPR-1DHP station (version TCP/IP)

3.3 Rear elements

The rear element (B) carries the front element (A) and is mounted in the mounting bracket (C).

3.3.1 LPR-1DHP station with TCP/IP interface

The rear element of the LPR-1DHP station with TCP/IP interface provides the following connections (see

Figure 5):

- Ethernet connector (B2) for Network connection: type *Harting push pull*, available from SYMEO as *MTE000060 plug RJ45*.
- power supply and auxiliary feedthroughs (B3)
- insert nuts M6 (B4) for mounting in the mounting bracket
- pressure equalization membran (B6)
- USB connector (B7)



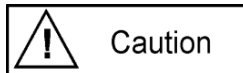
Figure 5: Rear element of the LPR-1DHP station

4 Electrical connections



Warning

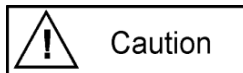
All installation, repair and servicing work must be carried out by qualified and trained technicians!



Caution

The diameter of all cables fed through cable glands must be within 4.5 to 10 mm, and have a round cross-section.

4.1 LPR-1DHP station with TCP/IP interface



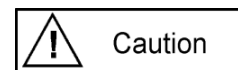
Caution

The pressure equalization membran (B6) must not be removed or loosened. Otherwise the housing will not be sealed in a water-proof manner.

4.1.1 Electrical connection

Power supply is connected using the power supply terminal (A4), Ethernet is connected to socket (A3).

Figure 6 depicts the pin assignment of (A4): Positive voltage can be connected either at pin 1 or 3, the negative or ground voltage is connected to pin 2.



Caution

Polarity reversal or otherwise faulty connection can damage the LPR-1DHP station.

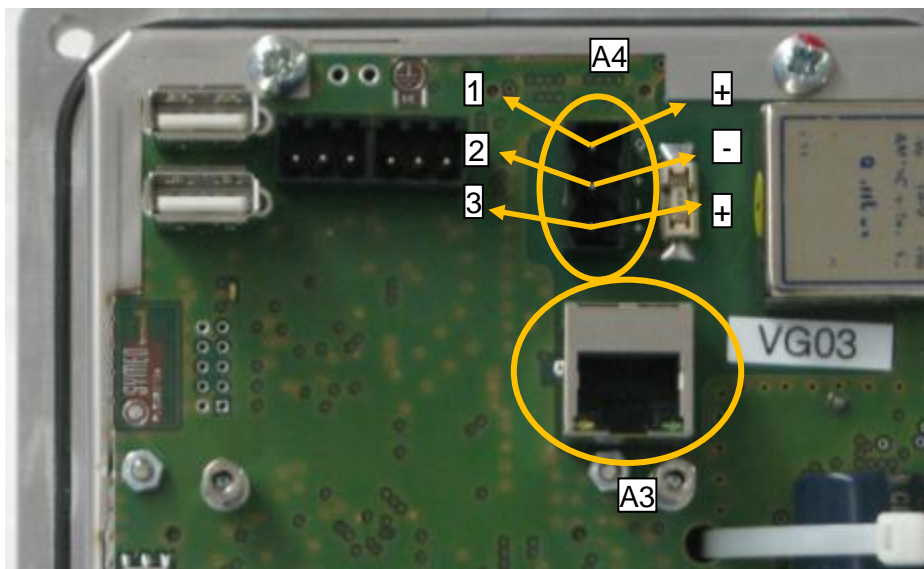


Figure 6: Electrical connections

4.1.2 Mode of operation

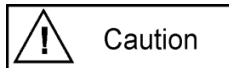
For standard operation of LPR-1DHP stations with TCP/IP interface the rotary switch (S2) has to be set to position **3** (see Figure 6).

4.2 LPR-1DHP configuration with USB interface

4.2.1 Electrical connection

Power supply is connected using the power supply terminal (A4), USB is connected using terminal (B6).

Figure 7 depicts the pin assignment of (A5). The pin assignment of (A4) is similar to (A4) as described in section 4.1.1.



Polarity reversal or otherwise faulty connection can damage the LPR-1DHP station.

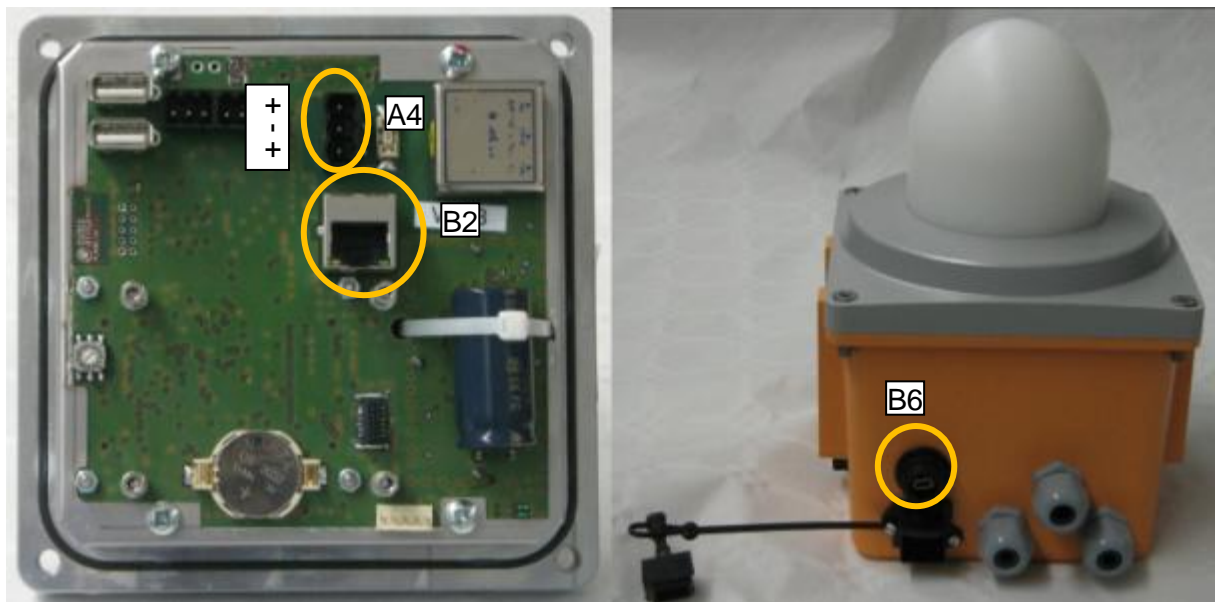


Figure 7: Electrical connections

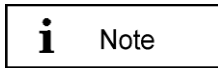
4.2.2 Mode of operation

For configuration of LPR-1DHP stations with USB interface the rotary switch (S2) has to be set to position **0** (see Figure 7).

5 Mounting



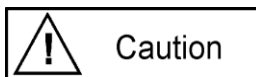
- When the system is mounted on fixed tubes the necessary measures to prevent slippage of the system must be taken
- All installation, repair and servicing work must be carried out by qualified and trained technicians!



A lot of the terms used in the following description are explained in Figure 1 and Figure 3.

The LPR-1DHP station (front and rear element) is delivered pre-mounted, and with a separate mounting bracket. Figure 1 shows the complete system including mounting bracket. The mounting bracket must be mounted with a separate pipe clamp on a pipe. For mounting the system please proceed as follows:

- ⇒ Please use a torx wrench type T25 to remove the front element A from the rear element B by loosening of the mounting screws (A2). If necessary you can disconnect the ethernet cable (B5) from the front element (A3) to be more flexible.
- ⇒ Insert the power supply cable in the cable feedthrough (B3) and connect it to the power supply terminal (A4) on the rear element (A); siehe Figure 6.
- ⇒ Reinsert the Ethernet connector (B5) of the rear element (B) into the connector (A3) of front element (A). Mount the front element (A) on the rear element (B). It might be necessary to tighten the inserted power cable.
- ⇒ Fix the front element on the rear element with the housing screws (A2) using a torx wrench T25.
- ⇒ Carefully tighten the cable feedthrough with flat wrench SW19.
- ⇒ Mount the mounting bracket (C) on a pipe installed at a suitable place. Do not tighten the screws of the pipe-clamp yet, the system must be aligned first.
- ⇒ Mount the LPR-1DHP station in the mounting bracket (C). When tightening the screws in the mounting slot (C1) make sure that you can still align the system unit.
- ⇒ Carefully align both units. To do so, it is recommended to use a laser level fitted into the alignment aid (B1).
- ⇒ Finally fix the system by tightening the screws of the mounting bracket and the pipe clamp. Flat wrench SW 11 and 13 are required.



- Avoid entry of foreign objects or liquids into the system unit, especially on the PCB stack of front element (A) or within rear element (B).
- It is important that both units have the same orientation, e.g. the display of both units facing the ceiling.
- Careful mounting of the system is required. It is important that the joint (A6) remains clean and is not damaged, otherwise the protection class cannot be guaranteed.

6 Commissioning LPR-1DHP with TCP/IP interface

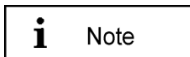
6.1 Requirements

In order for a station to be successfully commissioned, the LPR-1DHP components must have been installed correctly:

- ⇒ The station has been installed.
- ⇒ The station has been connected to the power supply.
- ⇒ Data link has been established over TCP/IP.

Once these prerequisites have been fulfilled, you can connect the station to the network and commission the LPR-1DHP system. How to do this is explained in the following chapters.

6.2 Connection to LPR-1DHP Station



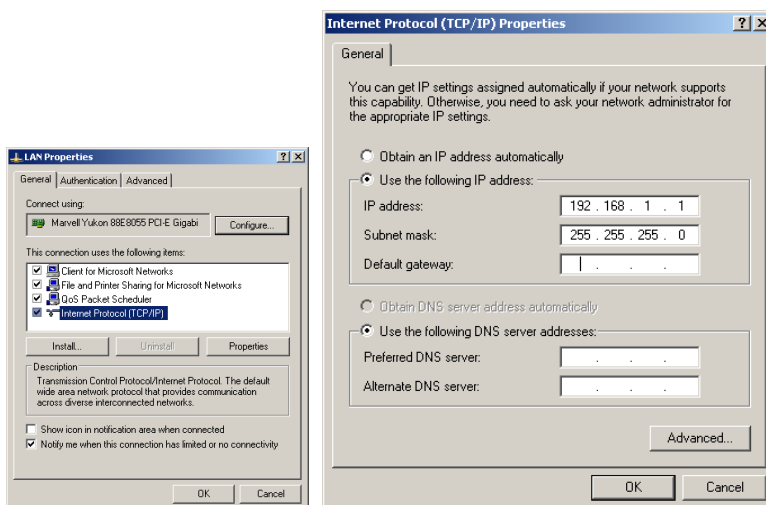
Note

With delivery the LPR-1DHP stations have the fixed IP-Address **192.168.1.99**, if no other IP-Address is labeled outside the LPR-1DHP station.

You can change the IP-Address of the LPR-1DHP station via the web interface of the LPR-Station.

To get a connection between your PC and the LPR-1DHP station it is maybe necessary to change the network parameters of your computer. Both units must be located in the same network. That means in this example that the first three numeric pads of both IP-addresses must be the same.

Disconnect your PC from the network. Connect the LPR-1DHP station and the computer with a network cable. Open your network settings of your computer.



Enter the following fixed IP-Address i.e. **192.168.1.1**. The subnet mask should be set to **255.255.255.0**.

Click in both windows **OK**.

Figure 8 – Network Settings

i Note

If your firewall settings are too restrictive, you may not get access to the LPR-1DHP station. In this case deactivate the firewall temporarily under the tab *Advanced*.

The LPR Station should be available via your PC now. You can check the connection with a *ping* to the LPR-1DHP station:

Open the Command-Window:

1. Push the Windows **Start** Button
2. Choose **Run**
3. Enter **cmd** and click **OK**
4. Enter in the cmd.exe window: **ping 192.168.1.99** or the IP-address of the LPR-1DHP station.



```
C:\WINDOWS\system32\cmd.exe
C:\>ping 192.168.1.99

Pinging 192.168.1.99 with 32 bytes of data:

Reply from 192.168.1.99: bytes=32 time<1ms TTL=64
Reply from 192.168.1.99: bytes=32 time<1ms TTL=64
Reply from 192.168.1.99: bytes=32 time<1ms TTL=64
Reply from 192.168.1.99: bytes=32 time<1ms TTL=64

Ping statistics for 192.168.1.99:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>_
```

Figure 9 – Ping LPR-1DHP Station

The LPR-1DHP Station should answer with a *Reply*.

7 Web Server for LPR-1DHP units with TCP/IP interface

Having a LPR-1DHP station with TCP/IP interface the network settings for this station are described in this chapter.

Therefore it is necessary to open a TCP/IP connection between your computer and the LPR-1DHP station.

7.1 Open Web Server

i Note

- The IP-address of the LPR-1DHP station is 192.168.1.99 per delivery status except another IP-address is labeled outside the box.
- You can establish a connection with your LPR-1DHP stations Web server either via HTTP or HTTPS if the station has been configured for this; see section "Settings", "HTTP" and "HTTPS" fields in the "Remote Access" area.
- In HTTP connections, the data is transmitted unencrypted. In HTTPS connections, it is encrypted for transmission (AES-256, 256-bit encryption).

⇒ Open your web browser. In the address bar of the web browser enter the IP-address of the LPR-1DHP station: `http://192.168.1.99` or `https://192.168.1.99`. Press **Enter**.

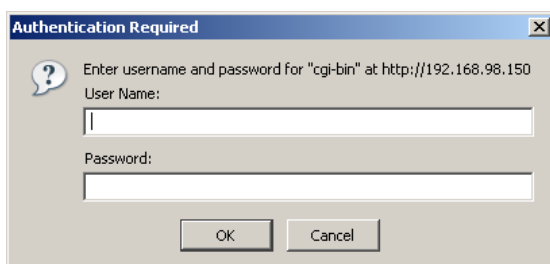


A connection is established with your LPR-1DHP station.

⇒ In the case of an HTTPS connection, you may see two dialog boxes. Confirm them both with **OK**.

Then the Welcome page for the LPR-1DHP station's Web server will appear.

⇒ Click the function you want in the navigation bar. The individual functions are described in the following sections.



You will be prompted to enter your information for authentication.

⇒ Enter user name **symeo** and the password, and click **OK**. The password has been set to **54all2u** by the manufacturer.

i Note

In order to protect your system from being reconfigured by unauthorized persons, change this to a company password that is only provided for authorized personnel; see section „*Remote Access*“ Area, table row *Password* from page 25.

7.2 Settings

With this function you can

- define the network settings on your LPR-1DHP station,
- define the network access settings,
- reboot the system,
- restore the default settings
- download a configuration backup

⇒ Click **Settings** in the navigation bar.

⇒ If you have not yet provided authentication information you will be prompted to do so now; see chapter 7.1.

The *Settings* page for the LPR-1DHP station's Web server is displayed as follows.



Structure of the *Settings* page:

LAN:

Overview about LAN settings of LPR-1DHP station (static or dynamic IP address); see chapter 7.2.1.

Network:

Network settings; see chapter 7.2.2.

Serial-to-Ethernet:

Settings of parameterization port and the data interface; see chapter 7.2.3.

Remote Access:

See chapter 7.2.4.

Miscellaneous:

Setting of time zone; see chapter 7.2.5.

Special Functions:

See chapter 7.2.6.

- ⇒ Press button **Upload changes** to accept the changes of the LPR-1DHP station.
- ⇒ Press button **Reboot System** to reboot the LPR-1DHP station with the new settings.

7.2.1 „LAN“ area

MAC-Address	Unique hardware address of the LPR-1DHP station on the LAN (Ethernet ID), (IEEE registered MAC address, not editable)
Current Mode	<p><u>Shows the current mode:</u> "Static IP-Address" or "DHCP Active". Per default the IP-address is set to the static IP-address 192.168.1.99.</p> <p>In "DHCP Active" mode, the LPR-1DHP station receives a dynamic or reserved IP address from the DHCP server. You can also ask your administrator or the SYMEO technical department about this.</p>

	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> i Note </div> <p>If the LPR-1DHP station is set to „DHCP“ but does not receive an IP-address from the DHCP server within 60 sec after the reboot the last applied fixed IP-address is used.</p>
Change Mode	A button is labeled "DHCP" or "Static" depending on the "Current mode" field. Click this button to switch from "DHCP Active" mode to "Static IP-Address" mode or vice versa.
IP-Address	<p><u>IP address of the LPR-1DHP station</u></p> <p>In "DHCP Active" mode, this address is assigned by the server and cannot be edited.</p> <p>In "Static IP-Address" mode you can assign a fixed (static) address here.</p>
Netmask	<p><u>Net mask of the LPR-1DHP station</u> (default: 255.255.255.0)</p> <p>In "DHCP Active" mode, the net mask is assigned by the server and cannot be edited.</p>
Gateway	<p><u>IP address of the standard gateway</u> (default: 192.168.98.254)</p> <p>Other LAN segments can be reached with the standard gateway.</p> <p>In "DHCP Active" mode this address is assigned by the server and cannot be edited.</p>

7.2.2 „Network“ Area

Hostname	<p><u>Hostname of the system</u> (default: "lprb-basestation").</p> <p>In "DHCP Active" mode, this hostname is also communicated to the DHCP/DNS server.</p> <p>A name that will be reserved on the DNS server can be entered here. You can also ask your administrator or the SYMEO technical department about this.</p>
DNS	<p><u>IP address of the DNS server:</u></p> <p>The DNS server is able to translate hostnames into IP addresses.</p> <p>In "DHCP Active" mode this address is assigned by the server and cannot be edited.</p>
Syslog	<p><u>IP address of the Syslog server</u> (default: 0.0.0.0, i.e. this service has been disabled).</p> <p>The Syslog server is a server in the network provided to receive system messages (system log). Transmission is packet-based (UDP) and unencrypted.</p>
NTP	<p><u>IP address of the NTP server</u> (default: 0.0.0.0, i.e. this service has been disabled).</p> <p>The NTP server is a server on the network from which the system can request the current time.</p>

7.2.3 „Serial-to-Ethernet“ Area

ttyS2	Port number of the TCP/IP port designated for sending and receiving data from serial port (ttyS2). ttyS2 is the port for the parameterization interface (Service Port, default: 3045)
ttyS3	Port number of the TCP/IP port via which the data from serial port (ttyS3) is sent and received. ttyS3 is the port for the data interface (Binary Port, default: 3046)

⇒ For each port, select the connection type between the LPR-1DHP station and PC, SPS, S7 from the *Connection Type* list. By default, both ports (ttyS2, ttyS3) are disabled. Due to the selected connection type, different input masks are visible which are explained below.

7.2.3.1 ttyS2 / Parameterization Port

This port is used for parameterization of stations by Symeo. Please do not use this port.

7.2.3.2 ttyS3 / Binary Port

Network Settings Area:

IP (Server)	For all active connection types the IP-address of the server is required to which the connection should be established.
Data Port	Port-Number of TCP/IP Port. Data of serial interface (ttyS3) is sent and received. ttyS3 is the binary port. Default value is 3046.
Reverse Port	For all active connection types a reverse channel for data transmission is required.

Serial Settings Area

Packet Filter	If selected type “Fixed Frame” it is possible to filter packed data. Default value is „none”. Example: “2,3” filters the data type 0x02 (Send request) and data type 0x03 (relay switching command).
Receive Size	If selected type “Fixed Frame” it is possible to set the frame size of the received data packed. Example: For 1D-application a frame size of 15 Byte is sufficient. A smaller telegram must me filled with 0x00.
Send Size	If selected type “Fixed Frame” it is possible to set the frame size of the sent data packet. Example: For 1D-applicaion a frame size of 21 Byte is sufficient. A smaller telegram is filled with 0x00 by the LPR-1DHP station.
Speed	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> i Note </div> Baud rate has to be set always to 19200

Connection Type Area

Disabled	The port is „Disabled“ and not be reachable via TCP/IP.
TCP – Variable Frame – Listening on Data Port	The LPR-1DHP station is waiting for incoming connection on the <i>“Data Port”</i> . If the connection is opened successful you can open the binary port. „ <i>Variable Frame</i> “ means activated „ <i>Byte Stuffing</i> “ (no fixed protocol length).
TCP – Variable Frame – Connecting to Data Port	The LPR-1DHP station establishes the connection to the entered server IP-address. Setting <i>“Random”</i> means both communication partners arrange the reverse channel autonomously. If the connection is opened successful you get access to the binary port. „ <i>Variable Frame</i> “ means activated „ <i>Byte Stuffing</i> “ (no fixed protocol length).
TCP – Fixed Frame – Listening on Data Port	The LPR-1DHP station is waiting for an incoming connection on the <i>“Data Port”</i> . If the connection is opened successfully you can open the binary port. „ <i>Fixed Frame</i> “ means deactivated „ <i>Byte Stuffing</i> “ (fixed protocol length).
TCP – Fixed Frame – Connecting to Data Port	The LPR-1DHP station establishes the connection to the entered server IP-address. Setting <i>“Random”</i> means both communication partners arrange the reverse channel autonomously. If the connection is opened successful you get access to the binary port. „ <i>Fixed Frame</i> “ means deactivated „ <i>Byte Stuffing</i> “ (fixed protocol length).
UDP – Fixed Frame – Sending to Data Port	The LPR-1DHP station sends and receives data (UDP) to and from the entered server IP-address. The reverse channel uses also the data port. „ <i>Fixed Frame</i> “ means deactivated „ <i>Byte Stuffing</i> “ (fixed protocol length).

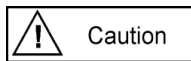
7.2.4 „Remote Access“ Area

Telnet	Click this checkbox to allow or prevent console accesses to port 23 via Telnet (checked: accesses are allowed). The port number is not editable. See also section "Extended system access".
SSH/SCP/SFTP	Click this checkbox to allow or prevent console accesses to port 22 via SSH (Secure SHell and data transmission via SCP (Secure CoPy) or SFTP (Secure File Transfer Protocol) (checked: accesses are allowed). The port number is not editable. See also section "Extended system access".
HTTP	Click this checkbox to permit or forbid accesses to the LPR-1DHP station's Web server via HTTP (unencrypted transmission) (checked: accesses are allowed). You must also enter the corresponding port number as appropriate. The port number is set to 80 (http protocol standard) by the manufacturer.
HTTPS	Click this checkbox to permit or forbid accesses to the LPR-1DHP station's Web server via HTTPS (encrypted transmission) (checked: accesses are allowed). You must also enter the corresponding port number as appropriate. The port number is set to 443 (http protocol standard) by the

Web Server for LPR-1DHP units with TCP/IP interface

	manufacturer.
User	User ID for access to the TCP/IP port. It has been set to "symeo" by the manufacturer and cannot be changed.
Password	Enter the new password here if you want to change the password. The password has been set to "54all2u" by the manufacturer.
Repeat Password	Enter the new password again here if you want to change the password.

Extended system access („*Remote Access*“) enables console access via Telnet, SSH (Secure SHell), SCP (Secure CoPy) and via the serial port. This enables extended system information to be retrieved and troubleshooting to be carried out. We recommend that you disable all functions that are not required..



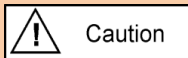
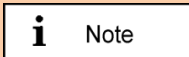
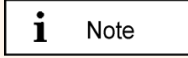
In extended system access, the user "SYMEO" has 'ROOT' privileges, i.e., full access to the system. Depending on the settings made, the system can also be damaged and such damage may or may not be repairable. If you have any questions, please contact the SYMEO technical department.

The enormous range of functions that are available to console access means that only some can be documented here. To find out more, please contact your IT administrator or Symeo Support.

7.2.5 „Miscellaneous“ Area

Timezone	If a NTP-server is available and the IP-address of the NTP-server is entered you can choose the time zone of the LPR-1DHP station. It is also possible to enter the time zone manually.
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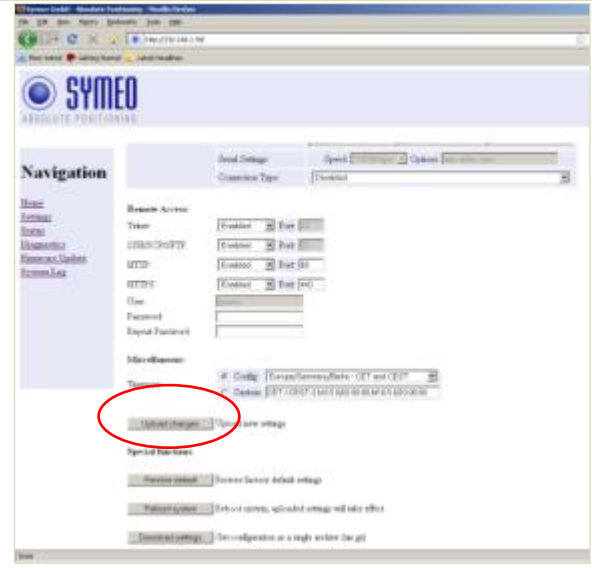
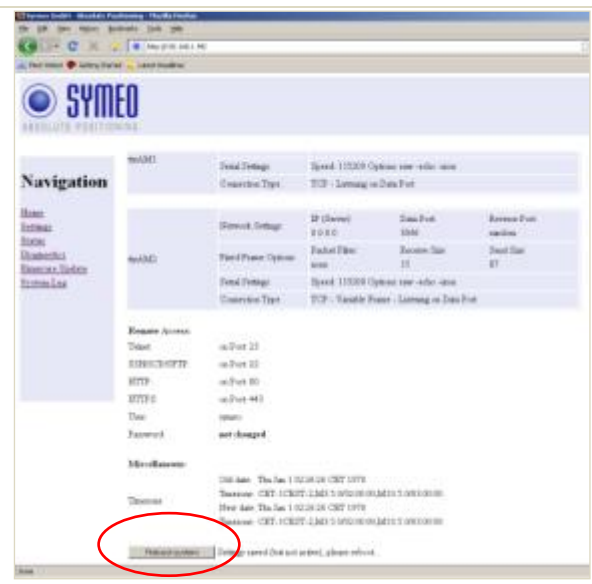
7.2.6 „Special Functions“ Area

Restore default	<p>Click this button to restore the settings made by the manufacturer.</p> <p>⇒ Click the "Execute" button (Restore factory default settings) in the "Special functions" area to cancel all changed settings and restore the factory settings.</p> <p>The settings made by the manufacturer are only activated after a reboot of the LPR-1DHP station. This means that changes of the settings (i.e. IP-address) are possible.</p> <div data-bbox="399 1646 587 1702" data-label="Image">  </div> <p>The settings affected will be deleted and set directly to the factory settings.</p> <div data-bbox="395 1758 584 1814" data-label="Image">  </div> <p>When the factory settings have been restored, it may be necessary to repeat the initial commissioning process of the system .</p>
Reboot system	<p>To accept the settings the LPR-1DHP station must be rebooted. Click the button "Reboot System" to reboot the system.</p> <div data-bbox="399 1960 587 2016" data-label="Image">  </div> <p>Before you reboot the system the settings must be loaded to</p>

	the LPR-1DHP station by pressing button “Upload changes”.
Download settings	Press the button „Download Settings“ to download a copy of the configuration as a backup.

7.2.7 Accept settings / System Reboot

As described in chapter 7.2 it is necessary to transmit the changes to the LPR-1DHP station and afterwards reboot the station.

	<p>⇒ Press button „Upload changes“ to load the changes.</p>
	<p>⇒ Scroll down to the end of the page and press „Reboot System“ to reboot the LPR-1DHP station.</p>

7.3 System Status

With this function, you can display the current system status.



⇒ Click "Status" in the navigation bar.

If you have not yet provided authentication information, you will be prompted to do so now; see section "Starting and using the Web server".

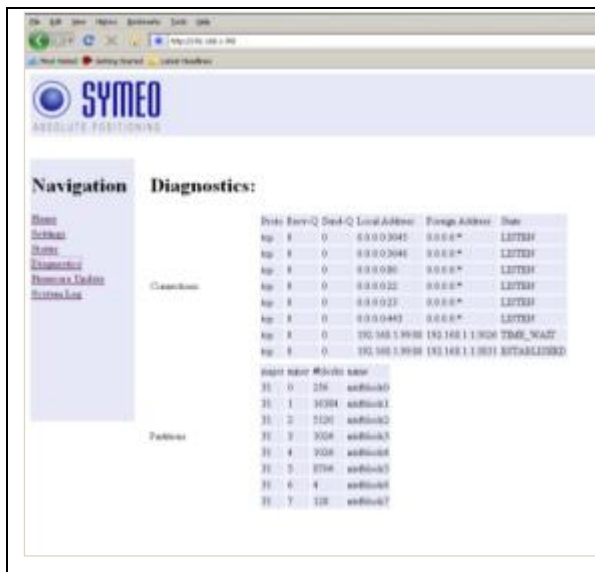
The Status page for the LPR-1DHP station's Web server is displayed.

The fields have the following meanings:

Uptime	01:27:47 – Current system time up 20 min – Time since the last system start load average: 0.00, 0.00, 0.00 – Average system load for the last 1, 5 and 15 minutes. The load indicates how many processes are waiting to receive computing time
Memory (RAM)	MemTotal: Total usable working memory (physical RAM less a number of reserved bits and the kernel code) MemFree: Free working memory
Filesystem	Details about the active file systems and associated statistics.
OS Version	Operating system, kernel, compiler and compiling date
SVN Version	Current version of software
Description	Description of the system
System Date	Current system time
Watchdog	Status of the hardware watchdog, including counter of start operations since the last switch-on (connection of the power supply). A value between 2 and 127 means that the watchdog has triggered that number of system restarts. The counter is reset at 'power-on-reset' (connection of the power supply) and 'user-rest' (jumper on motherboard). In a reboot (e.g. from the Web page), the current counter status is not reset.
CPU Info	Serial Number: Globally unique identification number of the processor used (applied to each chip individually with a laser during production). Silicon Revision: Version of the processor used 0x0 Rev. A 0x1 Rev. B 0x2 Rev. C

0x3 Rev. D0
0x4 Rev. D1
0x5 Rev. E0
0x6 Rev. E1
0x7 Rev. E2

7.4 Diagnostics



Connections: State of the active and inactive connection to the LPR-1DHP station

Partitions: Size and name of available partition of non-volatile memory.

i Note

The size of receive buffer (Recv-Q) and send buffer (Send-Q) should be zero if possible. A long lasting value greater zero means problems when receiving or sending data. This happens if the data cannot be readout fast enough.

Example 1 – waiting for incoming connection:

Proto	Recv-Q	Send-Q	Local-Address	Foreign Address	State
tcp	0	0	0.0.0.0:3045	0.0.0.0:*	LISTEN

If Connection Type „TCP - Listening on Data Port“ (ttyS2) is enabled this table shows further connection information.

Proto: Protocol (TCP, UDP)

Recv-Q: Number of buffered Bytes, which are received from the LPR-1DHP station

Send-Q: Number of buffered Bytes, which the LPR-1DHP station should send

Local-Address: LPR-1DHP Interface address (0.0.0.0 – listening to all interfaces)

Foreign Address: IP-address of opposite station

State: Status of connection

Example 2: - successfully established connection

Proto	Recv-Q	Send-Q	Local-Address	Foreign Address	State
tcp	0	1	192.168.1.99:3045	192.168.1.1:1333	ESTABLISHED

Of Connection Type „TCP - Listening on Data Port“ (ttyS2) is enabled this table shows further connection information.

Proto: Protocol (TCP, UDP)

Recv-Q: Number of buffered Bytes, which are received from the LPR-1DHP station

Send-Q: Number of buffered Bytes, which the LPR-1DHP station should send

Local-Address: LPR-1DHP Interface address (192.168.1.99) with port (3045)

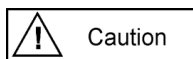
Foreign Address: IP-address of opposite station (192.168.1.1) with port (1333)

State: Status of connection

7.5 Update Firmware

With this function you can update the firmware.

The firmware can be updated for example when a firmware with improved functional scope is available for the LPR system.

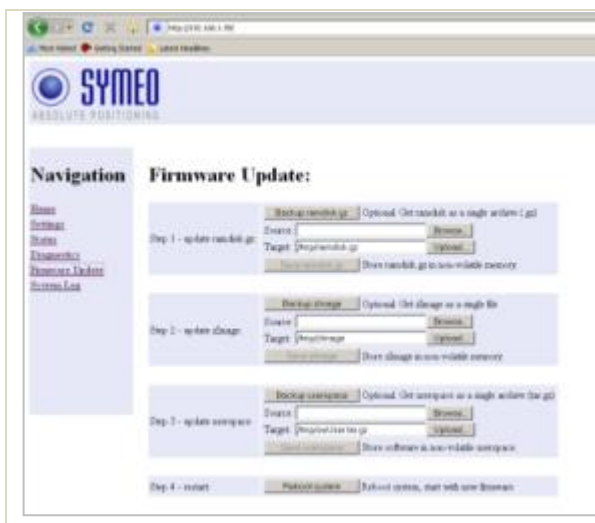


The system can also be irreparably damaged by a firmware update. Please make absolutely sure that the files are correct (file names and the version has been released by SYMEO), and proceed carefully and methodically. If the firmware update has not been carried out properly, or if problems arise of the system can no longer be accessed, contact Symeo Support.

⇒ Click "Firmware Update" in the navigation bar.

If you have not yet provided authentication information, you will be prompted to do so now; see chapter 7.1.

The Firmware Update for the LPR-1DHP station's Web server is displayed.



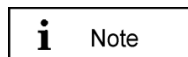
A firmware update is performed in several steps:

Step 1: File system

Step 2: Linux-Kernel

Step 3: Optional (2D Application)

Step 4: Restart

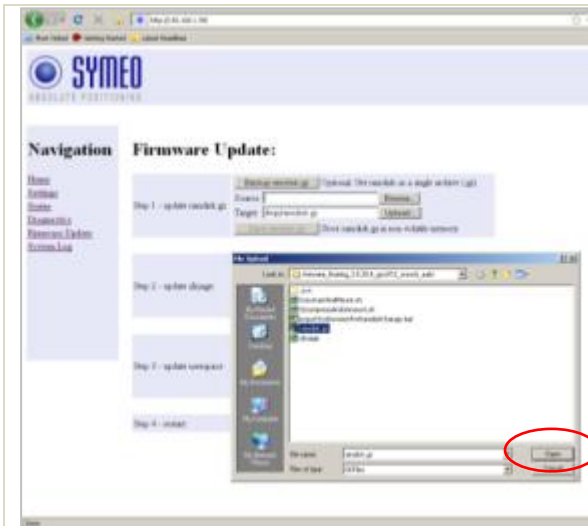


Note Step 3 is exclusively for an update for 2D application. Otherwise this part can be skipped.

7.5.1 Step 1 – File system

i Note

It is possible to make a copy of the actual firmware by downloading the firmware from the LPR-1DHP station. Click the button „Backup ramdisk.gz“.



⇒ Click the "Browse" button in the "Step 1 – flash ramdisk.gz" area.

A file browser window will open.

⇒ Navigate to the file you want and click "Open".


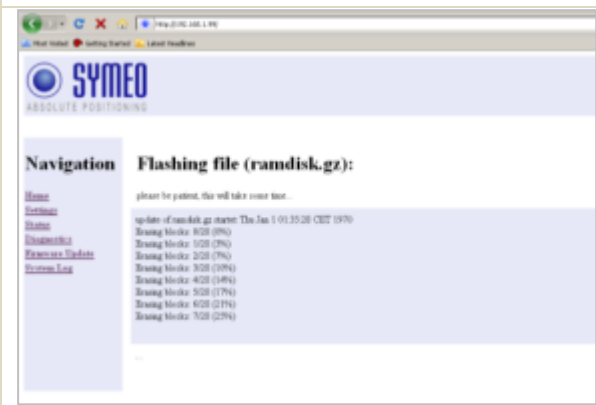



⇒ Click the "Upload" button in the "Step 1 – flash ramdisk.gz" area.



The file has been transferred.

⇒ Click the "back: Firmware Update" link.

	<p>⇒ Click the "Execute" button in the "Step 1 – flash ramdisk.gz" area to transfer the file to the non-volatile memory.</p>
	<p>Transfer progress is displayed in a message window.</p>
	<p>You will know when this operation is complete because a message: "... done, file ramdisk.gz removed" will be output and a link "back: Firmware Update" is provided</p> <p>⇒ Click the "back: Firmware Update" link.</p>

7.5.2 Step 2 – Linux Kernel

i Note

It is possible to make a copy of the actual firmware by downloading the firmware from the LPR-1DHP station. Click the button „Backup zImage “.



- ⇒ Click the "Browse" button in the "Step 2 – flash zImage" area.
A file browser window will open.
- ⇒ Navigate to the file you want and click "Open".



- ⇒ Click the "Upload" button in the "Step 2 – flash zImage" area.



- The file has been transferred.
- ⇒ Click the "back: Firmware Update" link.

7.5.3 Step 3 – Optional: Userspace

This step is exclusively for 2D-applications necessary and is executed the same way as described before.

7.5.4 Step 4 – Restart

To complete the firmware update, you must restart the system.

	<p>⇒ To do this, click the " Reboot system " button in the "Step 4 – Restart" area. The system will be restarted.</p>
	<div data-bbox="821 1070 1007 1122" style="border: 1px solid black; padding: 2px;"> <p>i Note</p> </div> <p>If the new firmware contains additional configuration files the settings you made are set to factory settings. This applies also for the IP-address which is set to the default value 192.168.1.99.</p> <p>Symeo recommends restoring the factory settings after a firmware update (see section 7.2.6) and reenter the customer settings.</p>

7.6 System Log

With this function, you can display the system messages (system log). The system messages are written to a 200 KB capacity memory. When the memory is full, the oldest messages are overwritten. All messages are deleted upon restart.

<p>i Note</p>	<p>The system messages can also be transmitted to a server on the network at the same time, see the "Syslog" field in the "Network" area in section "Settings".</p>
----------------------	---



⇒ Click "System Log" in the navigation bar.

If you have not yet provided authentication information, you will be prompted to do so now; see chapter 7.1.

The last 10 system messages will be displayed. The message window is updated about once per second.

8 Protocol XP Description for TCP/IP and RS232

8.1 General Description

This protocol is the interface between a LPR-1DHP station and the user. The binary protocol XP protocol provides information in high density. Its structure ensures a simple implementation. The transfer is done in single data frames.

The interface for the binary protocol XP can either be a serial (RS232) interface or a TCP/IP or UDP interface. The baudrate of the serial interface must be set to 19200 baud.

8.1.1 Structure of Data Packet

The binary protocol XP was originally designed for transmission over RS232 interfaces.

When the protocol is used on a RS232 interface each data packet starts and ends with a reserved symbol. This reserved symbol cannot appear in the data stream.

Figure 1 shows the general structure of the data packet.

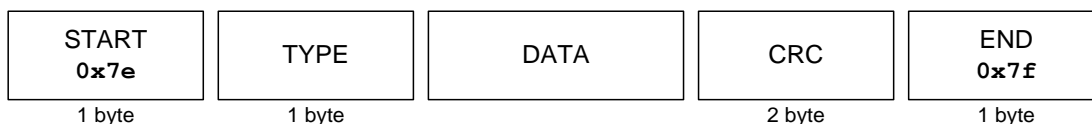


Figure 1: Structure of data the packet

The START and the STOP-field is in each data packet the reserved symbol 0x7e and 0x7f. TYPE indicates the type of the data packet. Therefore up to 256 different types can be defined. The TYPE-field is followed by the DATA-field. The DATA field contains the real data of the packet of the type TYPE. The CRC-field contains a check sum. The check sum is applied to all previous data fields except the START and END data field.

All multi-byte integers (e.g. CRC field) are encoded in Network-Byte-Order (Big Endian).

8.1.2 Byte Stuffing

The two symbols 0x7E and 0x7F are unique for START and STOP-fields. If these symbols occur within any other field (TYPE, DATA or CRC), they must be replaced by the following order:

original symbol	replaced by
0x7D	0x7D 0x5D
0x7E	0x7D 0x5E
0x7F	0x7D 0x5F

This byte stuffing scheme ensures that the receiver of the protocol can identify definitely the START-field within a flow of data, even if the symbol of the start field occurs within the DATA-field.

Example: If the symbol 0x7d is read, it must be cancelled. The following symbol must be XOR combined with 0x20 to recreate the original symbol.

i Note

Byte stuffing is deactivated for the fixed frame protocol (compare chapter 8.3).

8.1.3 CRC

The CRC-16-IBM with polynomial $x^{16}+x^{15}+x^2+1$ is used for the CRC. The CRC is calculated over all data fields (TYPE and DATA), but not for the START and END field.

The CRC-calculation is only applied to the original symbols. The appropriate calculation for coding must be applied **before** byte stuffing. If receiving the data from the LPR-1DHP system the byte stuffing must be resolved to get the original symbol. Then the CRC is updated with the original symbol.

8.2 Data Types

8.2.1 Type 0x00 – Distance Data

Direction: LPR-1DHP → User

Content	Length	Value	Data type
START	1	0x7E	
TYPE	1	0x00	
Internal service information	2	0x####	
Internal service information	2	0x####	
Internal service information	1	0x##	
Distance [mm]	4	0x#### ##	signed integer
Velocity [mm/s]	4	0x#### ##	signed integer
Level [dB]	1	0x##	signed integer
Error	1	0x##	unsigned integer
Internal service information	1	0x##	
CRC	2	0x####	
END	1	0x7F	

Total length without byte stuffing: 21 byte

8.2.2 Example of Distance Data

7E 00 08 03 08 02 11 00 00 10 62 00 00 00 7A E6 00 00 AF C4 7F

Figure 10 - Protocol for a single 1D measurement

This protocol shows a simple example for 1D measurement.

Distance data:

7E 00 08 03 08 02 11 00 00 10 62 00 00 00 7A E6 00 00 AF C4 7F	
7E _{hex}	START byte
00 _{hex}	TYPE (00: Distance Data)
08 03 _{hex} = 00001 0000000001 1 _{bin}	internal service information
08 02 _{hex} = 00001 0000000001 0 _{bin}	internal service information
11 _{hex} = 0001 0001 _{bin}	internal service information
00 00 10 62 _{hex} = 4194 _{dec}	Distance: 4194 mm
00 00 00 7A _{hex} = 122 _{dec}	Velocity: 122 mm/s
E6 _{hex} = 230 _{dec}	Level: 230 – 256 = -26 dB
00 _{hex}	Error status: 0 means no error; unequal 0 means error (error description see see chapter 8.4)
00 _{hex}	internal service information
AF C4 _{hex}	cyclic redundancy check
7F _{hex}	END byte

8.3 Binary protocol XP over TCP/IP: Fixed Frame Protocol

If the LPR-1DHP station has a TCP/IP interface two options are available for the protocol. Either you use the protocol as it is sent from the serial interface (with different data type lengths, byte stuffing) or you use a fixed frame protocol.

In the first case the data symbols 0x7e und 0x7f (which are reserved for the START and END field) are replaced (see chapter 8.1.2.) Byte stuffing causes a different protocol length.

For the fixed frame protocol each LPR-1DHP data packet is filled up with zero bytes to a fixed length of bytes (i.e. 87 bytes) before the data packet is sent. Byte stuffing does not occur. The START and the END byte are still used but not clear anymore due to not applying byte stuffing. The fixed length of the data packets can be set on the web-interface of the LPR-1DHP unit.

If TCP/IP is used the transmitted data have already a checksum. Therefore the checksum in the protocol is not as important as for the serial interface.

8.3.1 Detailed description TCP Fixed-Frame Protocol

If a TCP fixed-frame protocol is used, a working TCP connection between the PC and the LPR unit has to be guaranteed. Depending on the configuration of the LPR protocol

converter either the connection to a port on the LPR has to be initialized from the PC or the LPR unit is establishing a connection to a PC.

If the connection is established, the PC has to read the data from the LPR in fixed data length (i.e. 89 bytes). The first byte is always the START-byte and the second byte is always the TYPE-byte. The relevance of the following data is depending on the data type. Because no byte stuffing occurs the content for a special data type is always constant. For example the measured velocity of the distance data is always written in data bytes 12-15

8.3.2 Detailed description UDP Fixed-Frame Protocol

If a UDP fixed frame protocol is used, the IP and the UDP port of the PC has to be configured in the LPR protocol inverter. The converter sends each data packet as a UDP packet of a fixed length (89 byte) to the PC. Compared to the TCP fixed frame option the UDP fixed frame does not verify if the data packed arrived. The content is the same as for the TCP fixed frame protocol.

8.4 Error messages

The distance data contains an error field which indicates the status of the message. The following errors can occur:

Content	Source	Description	Value
no error		Measurement valid	0x00
no peak detected	Base Station	No measurement signal	0x01
peak too low	Base Station	Measurement signal is imprecise	0x02
nothing received	Transponder	No measurement data received	0x03
implausible speed	Base Station	Velocity is to high	0x04
measurement botched	Base Station	Measurement is not feasible.	0x05
no occupying received	Master Transponder	Measurement channel is not reserved	0x06
no results received	Master Transponder	No measurement data received	0x07
Trigger	Transponder	Unit did not attend the measurement	0x08