ESP
Enhanced Steering Performance

R-Net

permobil
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Produced and published by Permobil AB, Sweden
Edition 1, 2008-04
Product code: 205229-US-0
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Introduction

The purpose of the ESP module is to make your wheelchair safer to use. ESP stands for Enhanced Steering Performance.

The ESP module is programmed by Permobil to give the wheelchair optimal performance. Individual adaptations can mean that minor adjustments may be required at a later date. The preprogrammed parameters may only be adjusted by technicians familiar with the ESP module.

The ESP module is installed in the wheelchair chassis. See the service manual for the chassis for further information.

The ESP module is connected to the wheelchair control system. The module contains a sensor that measures any course deviations made by the wheelchair. A processor uses this information to correct any deviations from the course set by the user using the wheelchair’s steering device. The ESP module uses the information from the sensor and the steering device to calculate a corrected steering signal. The steering signal is then passed on to the wheelchair’s R-Net output stage, which controls the drive motors.

The function of the ESP module requires access to the full capacity of the output stage. These different parameters must therefore be adjusted to their maximum values or to other predefined values.

NB. The parameters for the output stage, Power Module (PM), are set by Permobil and must not be changed. The ESP module has integral functions for controlling the wheelchair’s performance, acceleration, course stability, etc. If any changes are required to the way the wheelchair is operated, the ESP module must be reprogrammed.
Safety rules

- There must be no changes made to the output stage parameters.
- The ESP module may only be programmed by technicians familiar with the ESP module's functions.
- Changes made to the ESP module parameters must be documented. The parameter values must be recorded before and after changes.
- Wheelchairs with ESP module installed are supplied programmed for optimum performance. Changes to the value of a parameter should mean a decrease in the current value. Raising a parameter’s value can mean that the wheelchair becomes unstable and difficult to maneuver.
- Once changes have been made to ESP module parameters, the wheelchair must be test-driven before being returned to the user.

NB. If tests are performed in which the ESP module is disconnected, please note that steering characteristics are set to a very high value. This makes the wheelchair very difficult to maneuver. Ensure that there is plenty of space around the wheelchair when the test is being performed.
## Programming

The ESP module has 20 parameters adjusted using Permobil PC Programmer for R-Net, product code 1822585, and the associated dongle. The procedure is described in greater detail in the PC Programmer for R-Net User Manual.

The ESP module is installed in the chassis. It is not possible to program the module directly.

The 20 programmable parameters can be seen in Fig. 1.

![Table of Parameters](image)

Fig. 1. Example of settings for R-Net control panel with joystick, JSM. The first 19 adjust R-Net output stage (PM) parameters for “speed”, which can be set for optional drive profiles. The twentieth parameter, “switched input”, is used to select the drive device used for each profile. “No” position means analog joystick or attendant control. For button control, change the parameter to “Yes”.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Profile 1</th>
<th>Profile 2</th>
<th>Profile 3</th>
<th>Profile 4</th>
<th>Profile 5</th>
<th>Profile 6</th>
<th>Profile 7</th>
<th>Profile 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profile Management</td>
<td>Mode 1</td>
<td>Mode 2</td>
<td>Mode 3</td>
<td>Mode 4</td>
<td>Mode 5</td>
<td>Mode 6</td>
<td>Mode 7</td>
<td>Mode 8</td>
</tr>
<tr>
<td>Configuration</td>
<td>Indoor/Inne</td>
<td>Normal</td>
<td>Profile 3</td>
<td>Profile 4</td>
<td>Profile 5</td>
<td>Profile 6</td>
<td>Profile 7</td>
<td>Profile 8</td>
</tr>
</tbody>
</table>
Error indications

The ESP module is equipped with two LEDs, one green and one red, to indicate module status. See Fig. 2. These are useful for troubleshooting. The table in Fig. 3 shows the functions of the LEDs.

The green LED means the wheelchair is ready for use.

The red LED gives access to various error codes by flashing at different intervals. The number of flashes indicates which error code it concerns. See section on troubleshooting, page 10.

![ESP module with LEDs](image)

**Fig. 2.** Both LEDs on the ESP module show the current status of the module. The red LED is on the left in the picture, and the green is on the right.

<table>
<thead>
<tr>
<th>Status</th>
<th>Red</th>
<th>Green</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before start</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>Module is not active</td>
<td>On</td>
<td>Off</td>
</tr>
<tr>
<td>Normal mode, wheelchair functions according to completed</td>
<td>Off</td>
<td>On</td>
</tr>
<tr>
<td>calibrations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calibration mode</td>
<td>On</td>
<td>On</td>
</tr>
<tr>
<td>Error indication</td>
<td>Flashes</td>
<td>Off</td>
</tr>
</tbody>
</table>

**Fig. 3.** Various indications of the LEDs.
Troubleshooting

There are a number of flash codes to assist in troubleshooting. The red LED on the ESP module flashing a certain number of times indicates an error. The table below specifies what error a certain number of flashes indicates. The control panel display also normally shows an error message in text format.

Permobil’s PC Programmer for R-Net provides further information on errors indicated.

<table>
<thead>
<tr>
<th>Description of error</th>
<th>LCD text on control panel</th>
<th>Flash-</th>
<th>Check and/or replace</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Module in Latched Drive Mode</td>
<td>Bad Settings</td>
<td>1</td>
<td>Programming</td>
</tr>
<tr>
<td>Incorrect reference voltage, VCC/2</td>
<td>Module Error</td>
<td>2</td>
<td>ESP module</td>
</tr>
<tr>
<td>PWM Offset adjustment outside its working range</td>
<td>Module Error</td>
<td>3</td>
<td>ESP module</td>
</tr>
<tr>
<td>Gyro sensor value outside specified limits</td>
<td>Module Error</td>
<td>4</td>
<td>ESP module</td>
</tr>
<tr>
<td>Module Test Flag not set in EEPROM</td>
<td>Module Error</td>
<td>5</td>
<td>ESP module</td>
</tr>
<tr>
<td>Incorrect calibration value in EEPROM</td>
<td>Recalibrate</td>
<td>6</td>
<td>ESP module</td>
</tr>
<tr>
<td>Cannot read program object in time, time limit reached.</td>
<td>Cycle Power</td>
<td>7</td>
<td>Switch system off/on. Check cabling and all R-Net units.</td>
</tr>
<tr>
<td>AD/DA Controller not synchronized</td>
<td>Cycle Power</td>
<td>8</td>
<td>Switch system off/on. Check cabling and all R-Net units.</td>
</tr>
<tr>
<td>Non-existent instruction</td>
<td>Module Error</td>
<td>9</td>
<td>ESP module</td>
</tr>
<tr>
<td>Program/system error</td>
<td>Module Error</td>
<td>10</td>
<td>Switch system off/on. Check cabling and all R-Net units.</td>
</tr>
</tbody>
</table>