E-T-A
Circuit Protection & Control

PowerPlex® User Manual

Volume 3: System Setup and Configuration

Edition

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Qualified Personnel

The system may only be installed, connected and set up in conjunction with this documentation. Commissioning and operation of a device/system may only be performed by qualified personnel. Within the context of the safety notes in this documentation qualified persons are defined as persons who are authorized to commission, ground and label devices, systems and circuits in accordance with established safety practices and standards.

Safety Instructions

Please follow the installation and adjustment instructions outlined in this manual carefully. Nonobservance may result in serious damage to the product or your system. E-T-A will not accept liability or warranty claims for issues caused by incorrect installation or handling by the customer or a third party.

About This Manual

The PowerPlex manual is intended for the professional boat electrician who wants to install and configure the E-T-A PowerPlex system for controlling the boat's electrical equipment.

We have divided the PowerPlex manual into three volumes to make handbook reading easy for you. You don't need to carry a bulky handbook around with you when working on the PowerPlex system. Depending on what you set out to do, whether you want to install the Powerplex hardware or rather define the system parameters using the Configuration Software, just consult the volume that describes the particular issue you are interested in.

Volume 1 **PowerPlex: System Description**

Here you find a general system overview, a description of the PowerPlex system architecture and a detailed explanation about the function of each PowerPlex system component. The Appendix contains background information which you may be interested in in connection with the principles of the PowerPlex system. It gives you a short introduction into CAN networking, and provides the technical data sheets of the main components, such as PowerPlex modules and circuit breakers.

Volume 2 **PowerPlex: Hardware Installation and Maintenance**

Volume 2 of the PowerPlex Manual Box gives you step-by-step instructions on how to install the system. Here you find out where and how to mount the DC Power Modules and the Panel Modules, how to wire them up, and how to connect the appliances and equipment you wish to control. The final chapter summarizes the installation instructions and provides you with a Quick Installation Guide.

Volume 3 **PowerPlex: System Setup and Configuration**

Volume 3 describes the PowerPlex Configuration Software and gives you step-by-step instructions on how to set up your PowerPlex system once the hardware has been properly installed. We take you through all the dialog boxes and menus of the software and create a configuration example. This example configuration shall be loaded into the PowerPlex hardware and tested. A separate chapter is dedicated to special PowerPlex functions that allow you to create a highly sophisticated CAN bus based control system for the boat's entire electrical equipment.

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Conventions and Symbols Used in This Manual

Bold	Menu names and items, text you must select in the PowerPlex configuration software, such as menu items, buttons, and commands.
Italics	Words and characters you see on the screen when you are working with the PowerPlex configuration software. In some cases, italics are used to emphasize a new term or an important fact.
Numbered lists	indicate sequential steps for completing a procedure.
Note	Notes are displayed on a grey background.
Important	Information that is critical for successful application and understanding of the product is displayed on a pale blue background.
→	indicates the progression of menu choices you should select in the graphical user interface (GUI), such as File → Print

The symbols used throughout this manual have the following meanings:

Caution
In this situation, you might do something that could result in equipment damage or loss of data.

Warning
You are in a situation that could cause bodily injury. Before you work on any equipment, you must be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents.

Empty page for your notes:

1. Welcome to PowerPlex Configuration

You are going to use the Windows-based PowerPlex Configuration Software to configure the functions and behaviour of the PowerPlex system installed on the boat. Using the PowerPlex configuration tool, you will define switching and lighting scenarios, monitoring, diagnostics and alarm indication schemes, and assign a unique identifier to each of the intelligent communication components of the system, i.e. to the Panel and DC Power Modules of your PowerPlex installation.

Figure 1 shows a typical PowerPlex arrangement comprising a number of distributed PowerPlex modules installed in different locations on the boat.

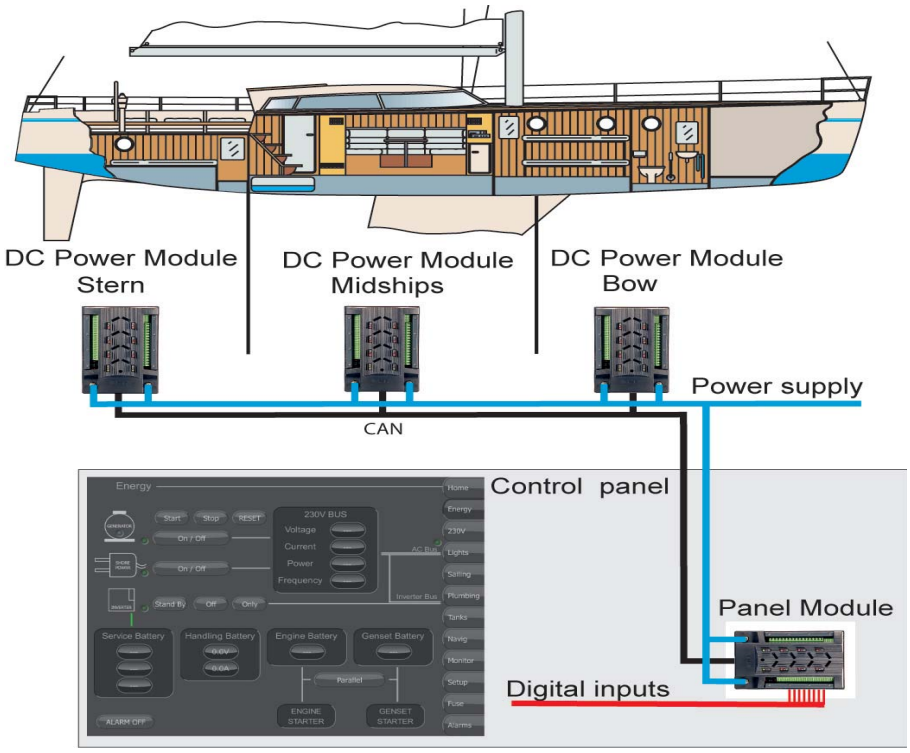


Figure 1: Distributed PowerPlex modules communicating over the CAN bus

The PowerPlex control project you are going to configure will in the end be a made-to-measure control scheme for your particular PowerPlex application. Of course you may copy, rename and modify it, and re-use it for similar control schemes on other boats. Equally, you may always modify and expand an existing PowerPlex configuration, for instance when newly connected appliances need to be incorporated into an existing PowerPlex control scheme on the boat.

The following chapters will guide you through the use of the PowerPlex Configuration Software. Please consult Chapters 2 to 7 for details on the system requirements, an introduction into the PowerPlex configuration tool and the components of a configuration. Chapters 8 and 9 illustrate the steps to go through and guide you through a configuration example.

2. System Requirements

2.1 PowerPlex Hardware

While you may indeed program all PowerPlex switching and montioring functions using computer and configuration software without an actual PowerPlex system being installed and connected, you will later have to complete this "dry practice session" by uploading the configuration into the PowerPlex hardware.

Only with the hardware properly installed and electrically connected, may you go through test runs and finally commission the complete system, which in the end will be the finely tuned combination of PowerPlex hardware and software.

The minimum requirement for a PowerPlex system is the connection of two PowerPlex modules to each other using a CAN bus cable, and of course the proper connection of power supply, operating and sensor elements, such as switches, pushbuttons and level sensors, and the loads to be controlled, such as lamps, pumps, wiper motors, and so on.

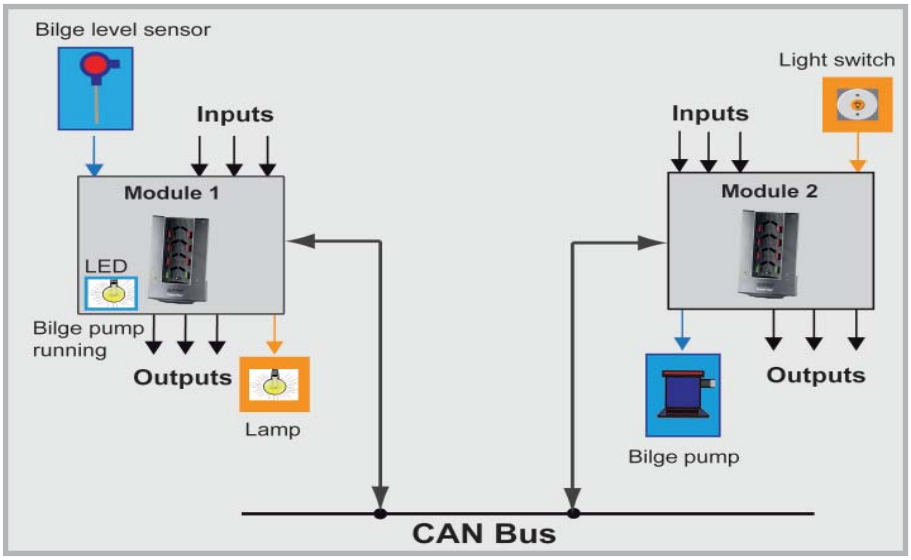


Figure 2: Minimum PowerPlex configuration comprising two PowerPlex modules (example)

For instructions on how to install and connect the PowerPlex hardware components, please consult PowerPlex Manual, Volume 2, "Hardware Installation and Maintenance".

2.2 PowerPlex Configuration Software

The PowerPlex Configuration Software is part of the PowerPlex delivery package. You will find it specified in the data sheets of the PowerPlex hardware modules (see PowerPlex Manual Volume 1, "System Description"), under the heading "Accessories".

When ordering your PowerPlex hardware, i.e. a certain number of Panel and DC Power Modules, please make sure to state explicitly whether or not you also need the PowerPlex Configuration Software. You may already have the software from a previous PowerPlex project.

Note:

The PowerPlex Configuration Software does **not** come automatically with every PowerPlex hardware module ordered as you may already have received this software in connection with a previous order and project.

If you need the software, please make sure to explicitly specify it on your order.

2.2.1 Computer Requirements

The PowerPlexConfiguration software runs on a computer or laptop using the Windows operating system. Please check your computer hardware to make sure that it meets the following basic requirements.

Function	Requirement
Operating system	Windows 2000, Windows XP
Processor	Pentium III, or higher
RAM	Minimum: 256 MBytes Recommended: 512 MBytes
Hard disk memory	500 MBytes min.
Screen resolution	1024 x 768 pixels, or higher
Input devices	Mouse, or other screen pointing device
Interfaces	USB 2.0

Table 1: Computer requirements for the PowerPlex Configuration Software

2.2.2 CAN-USB Driver Software

To upload a completed or modified PowerPlex configuration into the PowerPlex hardware, you will have to connect your configuration PC to the CAN bus network of the PowerPlex hardware.

To do so, you need

- the CAN-USB converter cable, connecting the USB port of your computer to the 9-pin D-SUB socket of the hardware
- the CAN-USB driver software, installed on your computer

Figure 3: CAN-USB converter cable (example: PEAK)

You may also use an RJ-45 adapter cable which connects the 9-pin SUB-D male connector of the CAN-USB converter cable directly to the RJ-45 socket of the PowerPlex module.

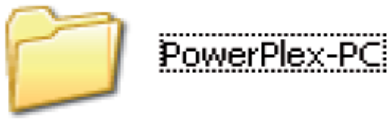
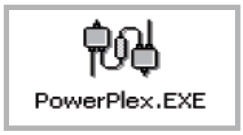
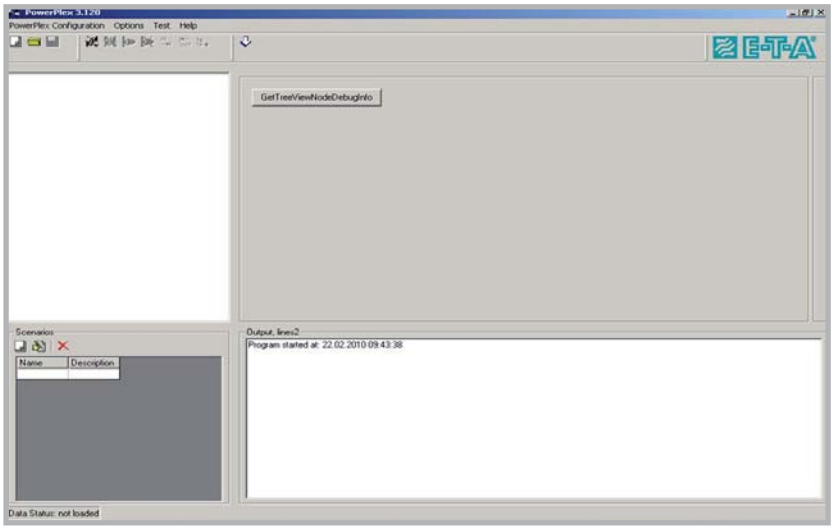
The PowerPlex Configuration Software supports the use of different CAN-USB converters, one of which - the PEAK PCAN-USB converter - is described in the data sheet of the PowerPlex modules. Each CAN-USB converter comes with the associated driver software, usually on a CD-ROM, which you have to install on your configuration computer.

Note:

The driver software of the selected CAN-USB converter must be installed on the configuration computer.

3. Installing the PowerPlex Configuration Software

The PowerPlex Configuration Software is supplied on a USB stick. Insert the memory stick in a USB port of your computer and use the Windows Explorer to access the contents of the memory stick. Copy the software onto the hard disk of your computer:

Step	Action
1	Use the Windows Explorer to access the USB stick containing the PowerPlex Configuration Software. The USB stick is identified as follows: 
2	Double click the PowerPlex symbol to open the memory stick and find the PowerPlex folder containing the configuration software. 
3	Copy the folder onto the hard disk of your configuration computer.
4	Inside the PowerPlex-PC folder on your hard disk, double click the **PowerPlex.EXE** file to start the PowerPlex Configuration Software. 
5	You will now see the opening window of the PowerPlex configuration software. 

4. The PowerPlex Configuration Software: Introduction

4.1 The Opening Window

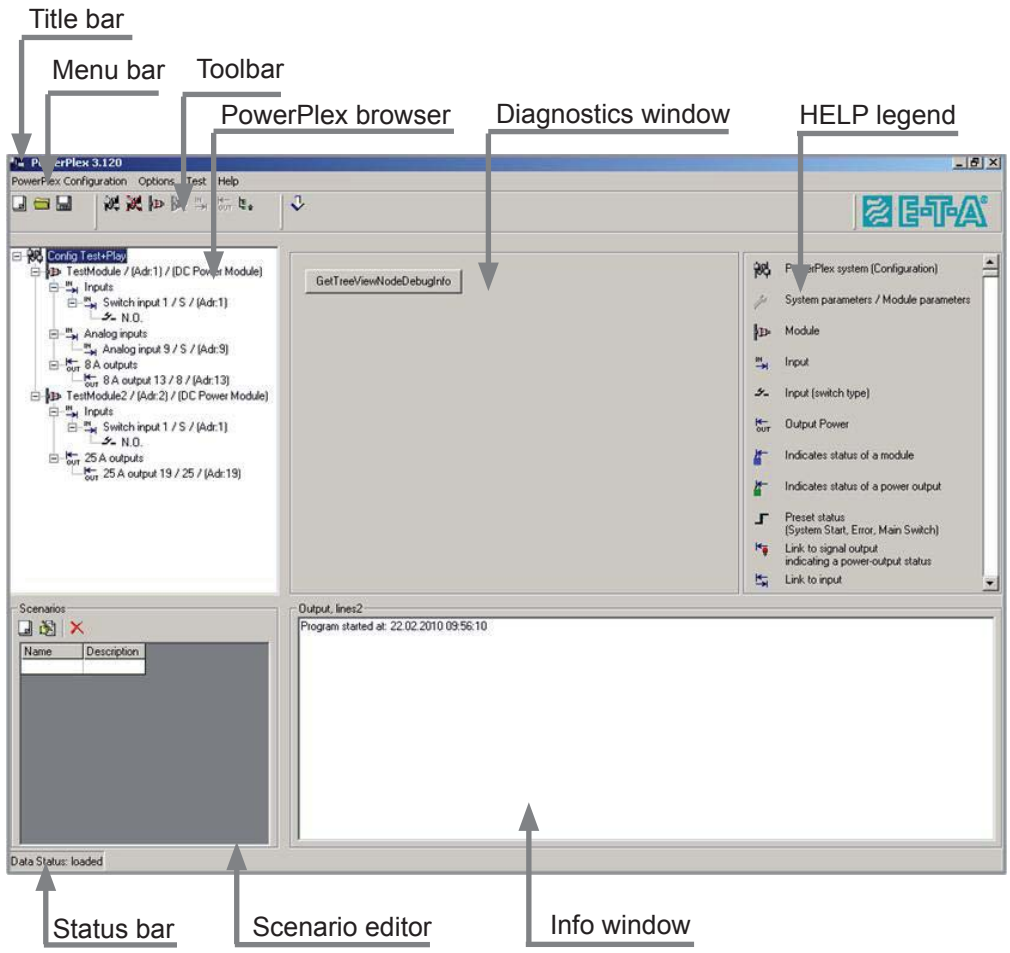


Figure 4: PowerPlex user interface: The opening window

Window Section	Description
Title bar	Displays program name and version number
Menu bar	Offers interactive PowerPlex menus for creating, modifying and testing PowerPlex configurations.
Toolbar	Offers interactive icons for quick access to program functions, such as Create, Save, Edite, Delete ...
Browser	Navigates you through all components of a PowerPlex configuration, e.g., configuration, modules, inputs, outputs, for selection and editing.
Diagnostics window	Displays diagnostics information during testing and debugging
HELP legend	Explains the meaning of PowerPlex icons. Can be hidden.
Status bar	Shows whether a PowerPlex configuration is loaded or not.
Scenario editor	Assists you in the creation of switching scenarios.
Info window	Displays information on program execution and its progress.

Table 2: Contents of the PowerPlex opening window

4.2 The Menu Bar

Figure 5: Menu bar

The PowerPlex menu bar gives you access to all menus for editing configurations and setting program parameters.

4.2.1 The PowerPlex Configuration Menu

The **PowerPlex Configuration** menu provides you with all commands that handle the configuration:

Figure 6: The Configuration menu

New	Creates a new PowerPlex configuration.
Load	Loads an existing configuration for further modification.
Import	Imports a configuration previously exported and saved in .mux file format.
Save	Saves the edited configuration under the specified name.
Save as...	Saves the edited configuration under a new name.
Export	Exports the configuration to a file in .mux format.
Transmit	Transmits the edited configuration to the PowerPlex hardware modules.
Print...	Takes you to a selection dialog in which you select the documents you wish to print out.
Exit	Closes the PowerPlex program after having reminded you to save your modifications

4.2.2 The Options Menu

The **Options** menu in the menu bar offers all the commands necessary to change system and program settings.

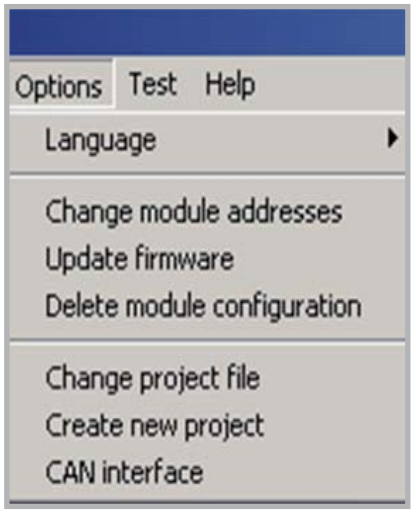


Figure 7: The **Options** *menu*

Language
Select the language of the Graphical User Interface (GUI) of the configuration software: English or German.

Change module addresses
Gives you access to the hardware modules in order to change their addresses. *)

Update firmware
Updates the firmware of the Powerplex modules. *)

Delete module configuration
Deletes the current configuration from a specific module or from all modules of the PowerPlex system. In a new dialog box, you will be asked to enter the bus address of the module(s) concerned. *)

Change project file
Calls a new project file (mdb file) into which the configuration can be saved.

Create new project
Creates a new project (mdb File) and asks you for confirmation whether this new project file shall be the container for the new configuration(s) you are going to program.

CAN interface
Selects the CAN interface driver used for the Configuration PC ↔ PowerPlex connection: PEAK USB, Sontheim CANusb light, PEAK USB, HSB-USBCAN, ...

4.2.3 The Test Menu

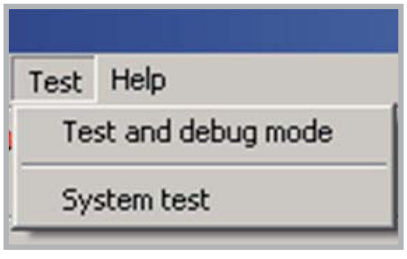


Figure 8: The Test menu

Test and debug mode
Opens a dialog which offers a number of test and debug functions assisting you in commissioning the configured PowerPlex installation, the CAN bus communication between the connected modules, and the switching actions. *)

System test
System test reserved for caravan multiplexing systems.

*) This action requires a connection between the Configuration PC and the CAN bus interface of the PowerPlex hardware.

4.2.4 The Help Menu

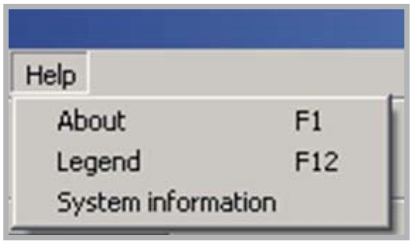


Figure 9: The Help menu

About

Informs you about the PowerPlex program version and the maximum possible I/O connections that can be configured for the various hardware modules.

Legend

Toggle command to open or hide the legend explaining the purpose of PowerPlex symbols.

System information

Informs you about the technical characteristics of the PowerPlex installation configured.

4.3 The Toolbar

The most important commands offered by the menus in the menu bar can alternatively be activated by symbols displayed in the toolbar. Thus, the toolbar buttons act as shortcuts to the actions most frequently used.

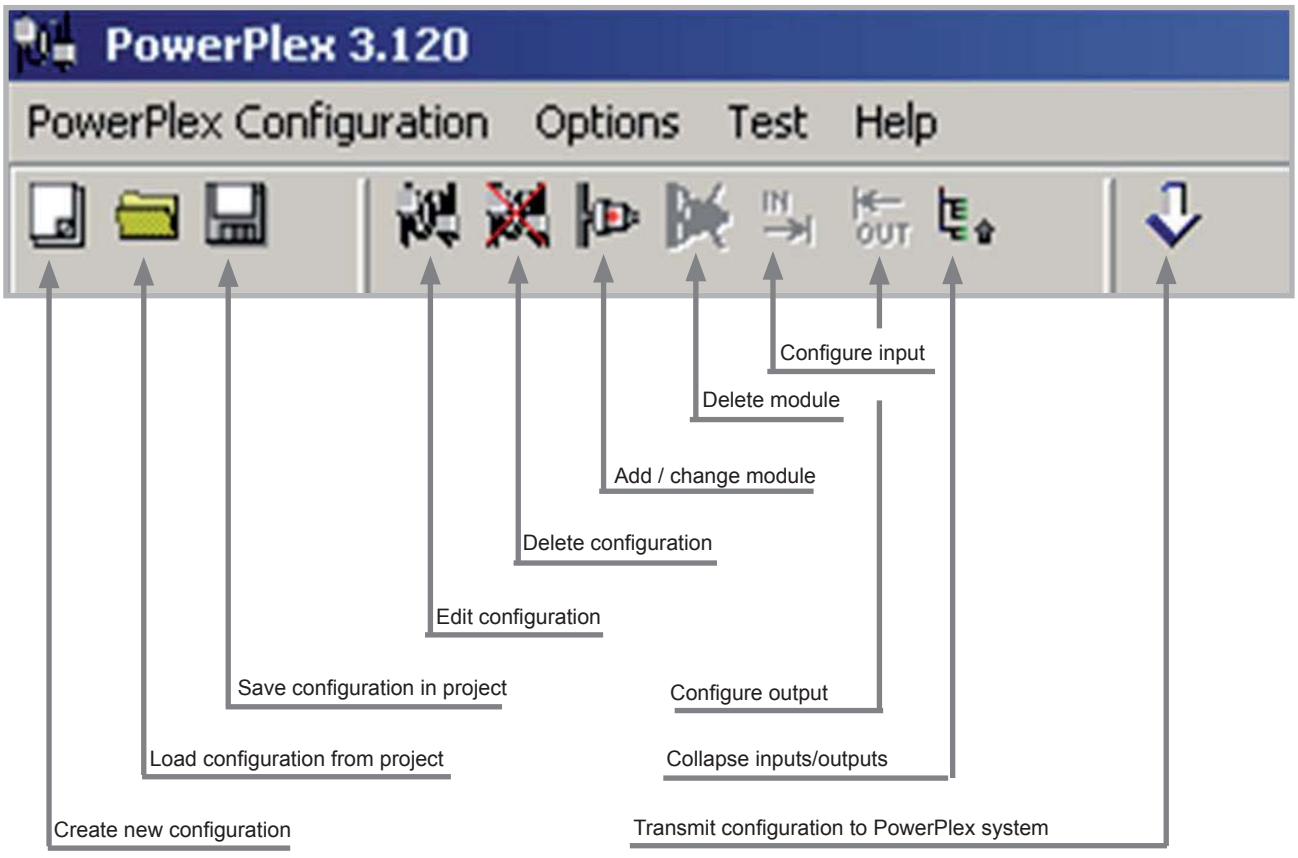


Figure 10: PowerPlex toolbar

5. Components of a PowerPlex Configuration

Before we turn to a programming example and gradually work through the configuration procedure, let us have a look at the major components that make up a PowerPlex configuration.

5.1 Configuration

All characteristics of your PowerPlex installation will be described in a "configuration". After completion, you will upload the configuration into the hardware modules of the system. Of course you can at any time down load it from the hardware back into the configuration software in order to modify it.

5.2 Project

A project is the container of one or several configurations. You may for instance have one project for the DOLPHIN boat series containing the configurations DOLPHIN SLIMLINE, DOLPHIN STAR and DOLPHIN DELUXE, and a completely different project for the STAR boat series containing configurations STAR 101, STAR 201 and STAR 301.

Creating a project, eventually containing configurations of different size and complexity but of similar electrical setup, helps you to build up a sort of configuration library for a particular boat series. In this way, you will expand your database step by step.

A project is contained in an Microsoft Access .mdb database. The **PowerPlex.mdb** database is provided as default project database. This project file will serve as the default container for the configuration you are going to create.

You can however create a new project file and save your newly created configuration in your own project database.

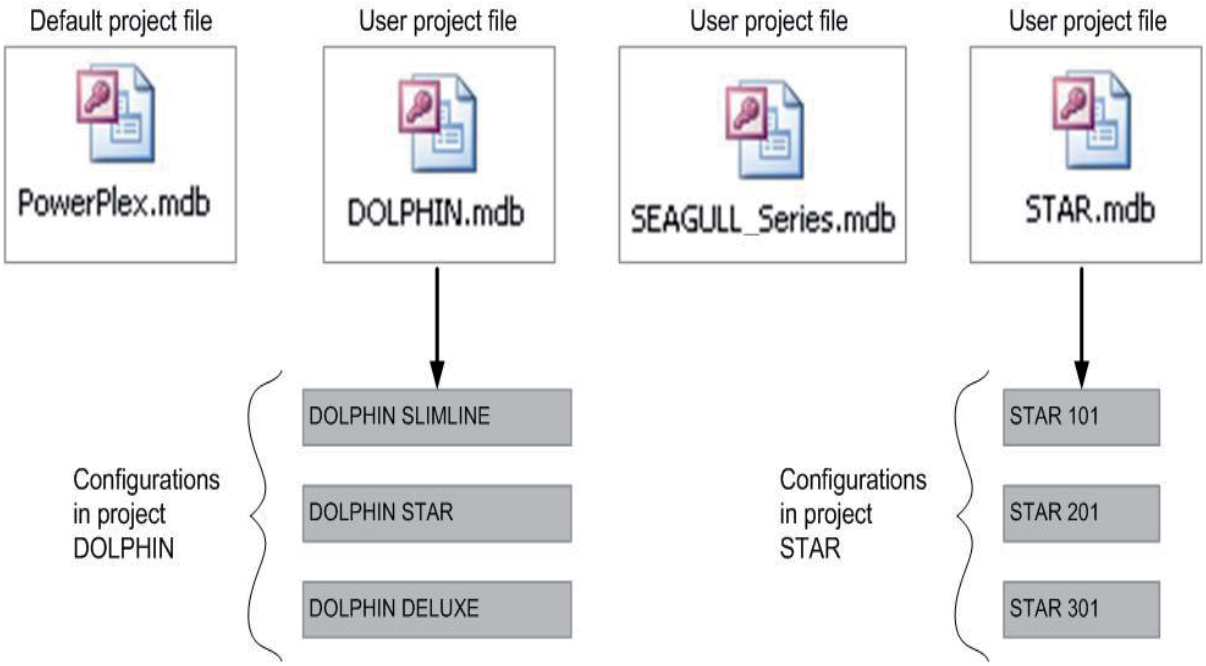


Figure 11: Projects, containing configurations

5.3 Modules with Inputs and Outputs

The configuration created with the PowerPlex configuration software maps the hardware installation actually installed on the boat and assigns functions to the various hardware components. These hardware components are the PowerPlex modules - DC Power Module and Panel Module - and a PC touch panel, if connected. The PowerPlex modules offer different types of inputs and outputs that are assigned to each other in order to produce the desired switching and control scheme for the electrical equipment on the boat.

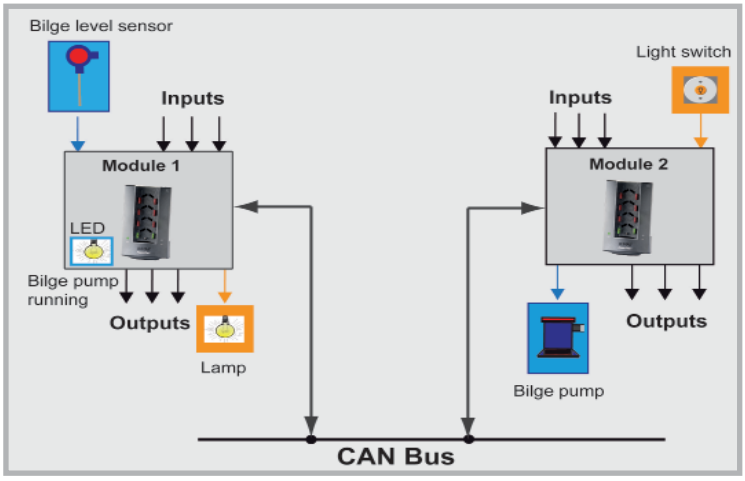


Figure 12: PowerPlex modules with inputs and outputs communicating to each other via the CAN bus

The following types of I/O are available:

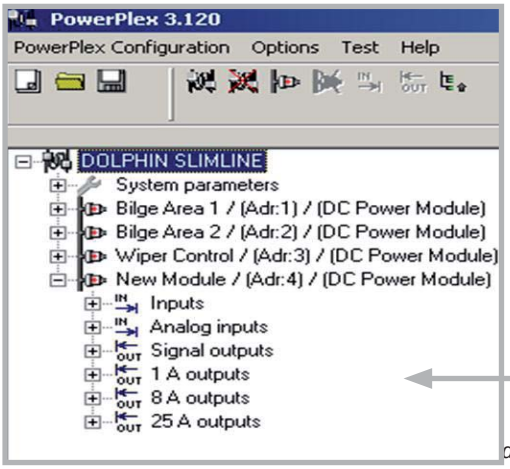
- Switch inputs
- Analog inputs
- Power outputs for 1 A, 8 A and 25 A loads
- Signal outputs

In the following chapters we shall look at the principal characteristics of these inputs and outputs and how to apply them in the overall PowerPlex installation.

For a detailed description of their electrical properties, please consult Volume 1 "System Description" and Volume 2 "Hardware Installation" of the PowerPlex manual series.

An example of how to configure these inputs and outputs is given in Chapter 9.

When a new module is inserted in the configuration, it shows all the inputs and outputs that this type of module has to offer so that they can be allocated and given attributes.



Inputs and outputs of a PowerPlex module inserted in the configuration

dule

5.4 Switch Inputs (Digital Inputs)

Depending on the module type - Panel Module or DC Power Module - the PowerPlex modules offer 32 or 8 switch inputs, respectively.

In the **Configure switch input** dialog, you define the basic properties of the switch input before you assign it to the power output which it is to be switched by the input.

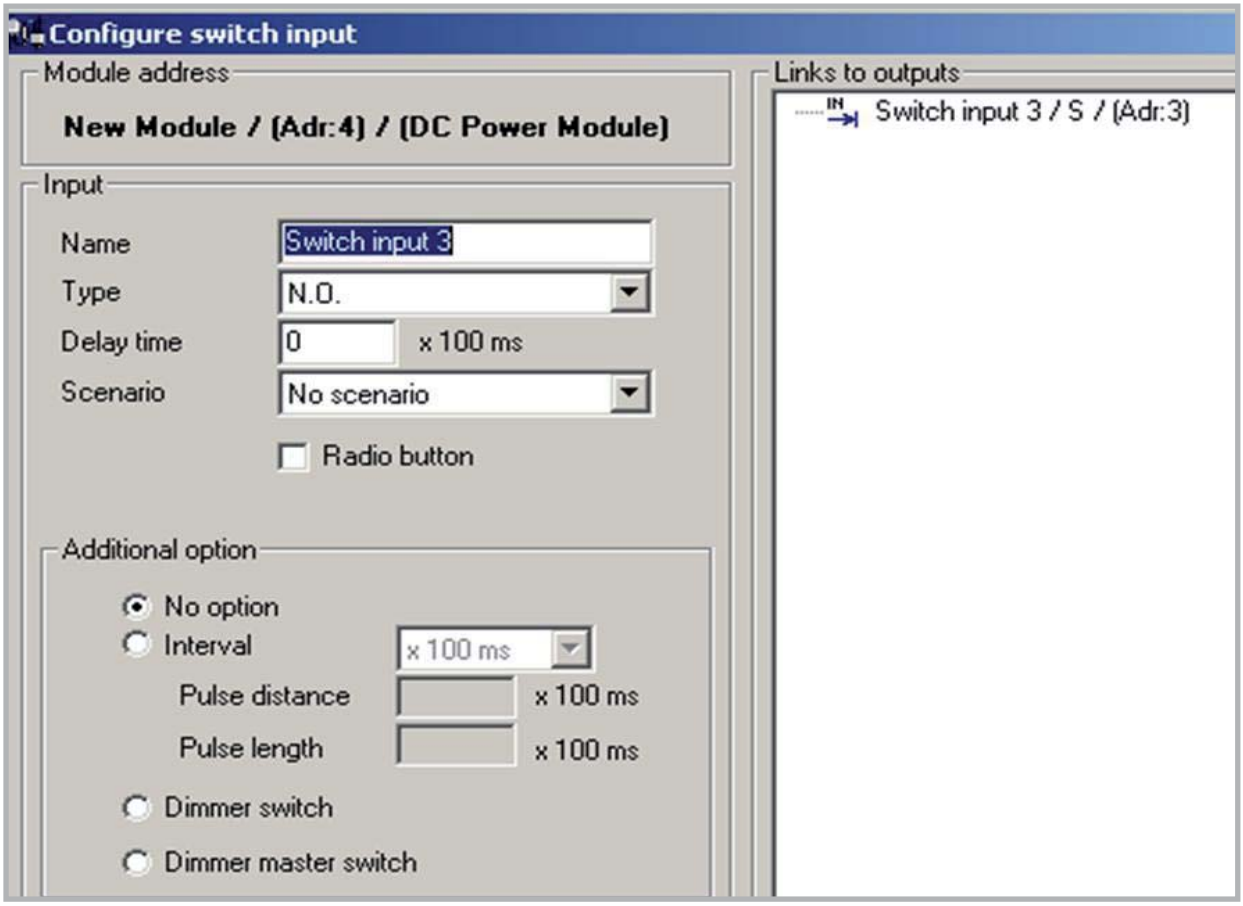


Figure 14: Properties of a switch input

Switch Input: Parameters

Parameters	Description
Name	Name of the input. Advice: type in a meaningful designation which allows you to identify the purpose of the input and the location of the assigned device.
Type	Drop-down list offering the following input types for selection: • N.O. (normally open, "make" contact) • N.C. (normally closed, "break" contact) • N.O. latched, • N.C. latched, • Touch Panel pushbutton
Delay time	Here you can define an ON / OFF delay for the switch action in steps of 100 milliseconds.
Scenario	Drop-down list from which you can select a scenario to be activated by this input. The scenarios from which you can choose at this point must have been previously created in the Scenario Editor. (→ Chapter 7). The drop-down list offers a maximum of 6 scenarios.
Radio button	Switches connected to the same output will deactivate each other when this function is active.
Interval	The **Interval** option allows you to define a pulse length for which the input will be active, and a pulse distance for which the input will be inactive after the defined pulse length has been elapsed. In other words, the active pulse length is followed by the inactive pulse distance which is followed by the active pulse length, and so on. The load output linked with this switch thus alternates between the ON and OFF state at an interval defined by the specified pulse ratio. The unit for the pulse duration can be selected from the drop-down list.
Dimmer switch	If selected, the switch assigned to this input takes on the function of a dimmer switch. → Chapter 6
Dimmer master switch	If selected, the switch assigned to this input takes on the function of a dimmer switch. → Chapter 6
Links to outputs	Information window listing the outputs assigned to the inputs.

5.4.1 Input Attributes

Switch inputs are characterized by **Input Attributes** which define their action when the connected switch or pushbutton is operated. **Input Attributes** are allocated in the **Configure power output** dialog when switch input and power output are assigned to each other and the input's switch attributes are selected.

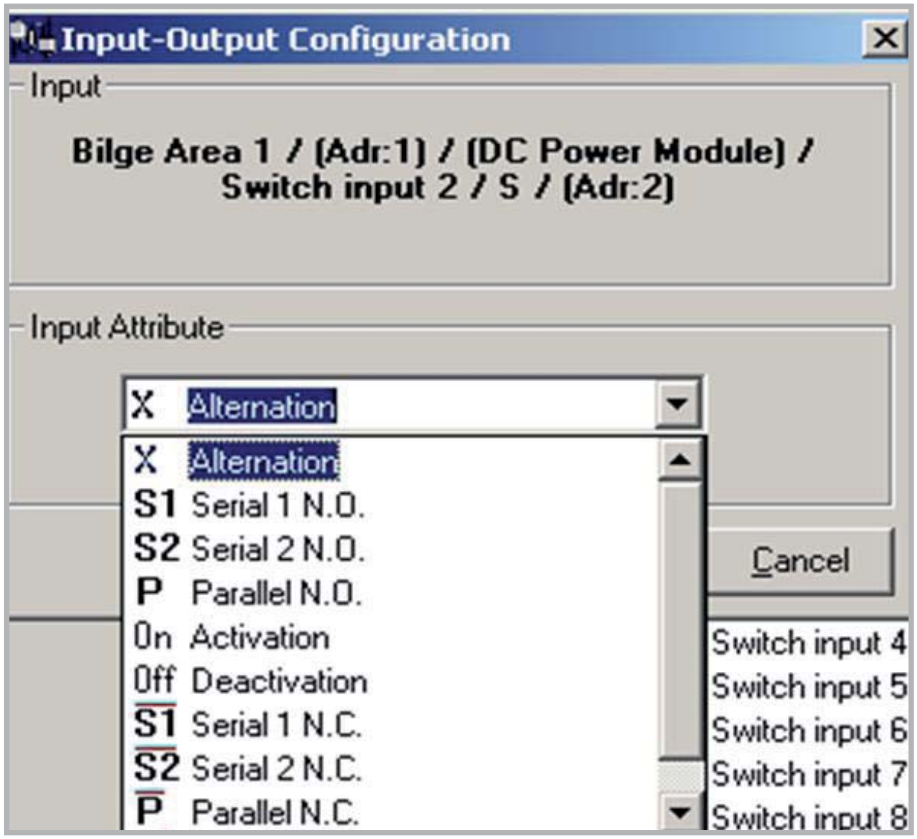


Figure 15: Input attributes selected in the Configure power output dialog

Attributes	Description
X Alternation	The output is switched each time the status of the linked input changes.
S1 Serial 1 N.O.	Denotes the logic position of the switch in the equivalent circuit diagram of possible PowerPlex links (→ section 5.4.2). The contacts are normally open (N.O.) until closed by operation of the switch.
S2 Serial 2 N.O.	Denotes the logic position of the switch in the equivalent circuit diagram of possible PowerPlex links (→ section 5.4.2). The contacts are normally open (N.O.) until closed by operation of the switch.
P Parallel N.O.	Denotes the logic position of the switch in the equivalent circuit diagram of possible PowerPlex links (→ section 5.4.2). The contacts are normally open (N.O.) until closed by operation of the switch.
ON Activation	In the equivalent circuit diagram of possible PowerPlex links, the ON switch operates in the changeover switch section. If the Emergency stop and Serial 2 sections are active, the ON switch connects the corresponding power output when activated. **Note:** Make sure NOT to use the ON / OFF function in conjunction with S1 /S2 or P attributes, The linked power output can only be switched off by activating an OFF switch defined for this purpose.
OFF Deactivation	Deactivates a power output that has been activated with an ON switch.
S1 Serial 1 N.C.	Denotes the logic position of the switch in the equivalent circuit diagram of possible PowerPlex links. The contacts are normally closed (N.C.) until opened by operation of the switch.
S2 Serial 2 N.C.	Denotes the logic position of the switch in the equivalent circuit diagram of possible PowerPlex links. The contacts are normally closed (N.C.) until opened by operation of the switch.
P Parallel N.C.	Denotes the logic position of the switch in the equivalent circuit diagram of possible PowerPlex links. The contacts are normally closed (N.C.) until opened by operation of the switch.

Table 3: Input attributes

5.4.2 Logic Switch Combinations

Switches with their various **Input Attributes** may be combined to form logic switch expressions. In this way, PowerPlex offers numerous flexible ways of controlling electrical equipment. The logic switch combinations are represented by equivalent circuit diagrams.

Switch inputs can be used as normally open (N.O.) and normally closed (N.C.) switch contacts and connected in series and / or in parallel to produce a variety of switch combinations. In an equivalent circuit, the normally closed contact (break contact) is represented with an upperscore as shown below.

Complete Equivalent Circuit Diagram

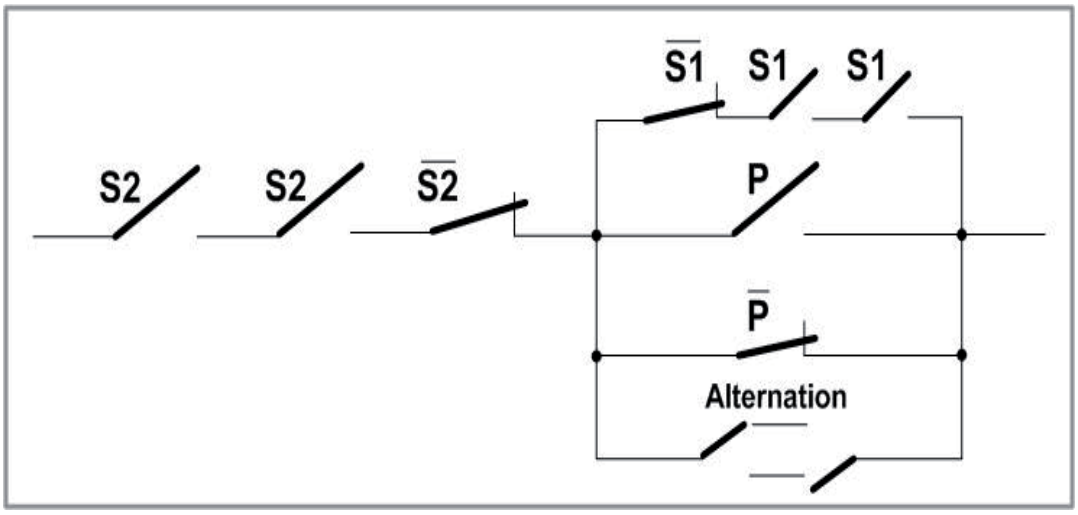


Figure 16: Logic switch combinations: Complete equivalent circuit diagram

The complete equivalent circuit shown in Figure 16 contains all logic states that a switch input can assume. A maximum of 6 switch inputs of different status may be combined to form one logic switch expression.

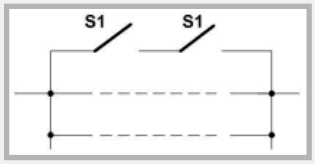
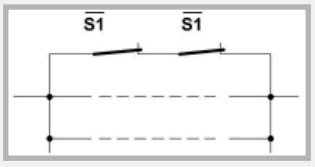
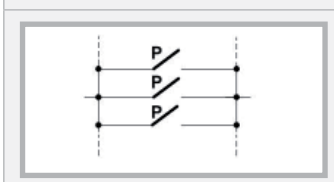
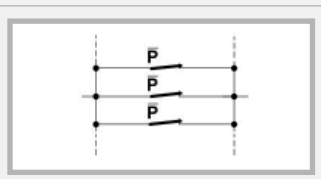
Switch Combination N.O.	Switch Combination N.C.	Description
		Switch contacts connected in series and placed in an upstream branch that precedes other branches, which in turn may be in parallel or in series. Representation of AND and NAND logic.
		Switch contacts connected in a series branch which in turn is in parallel to other parallel branches. Representation of AND and NAND logic.
		Switch contacts connected in parallel. The parallel branch is typically placed downstream, following a series circuit of S2 switch inputs. Representation of OR and NOR logic.

Table 4: Logic switch combinations

Note:

Make sure NOT to combine an ON / OFF / Alternation function in conjunction with P, S1 or S2 attributes!

Series S1 branch connected in parallel with parallel P branch

Figure 17 shows a series circuit comprising several S1 switch contacts, connected in parallel with a parallel branch comprising several P contacts, i.e. normally open (make) and normally closed (break) contacts.

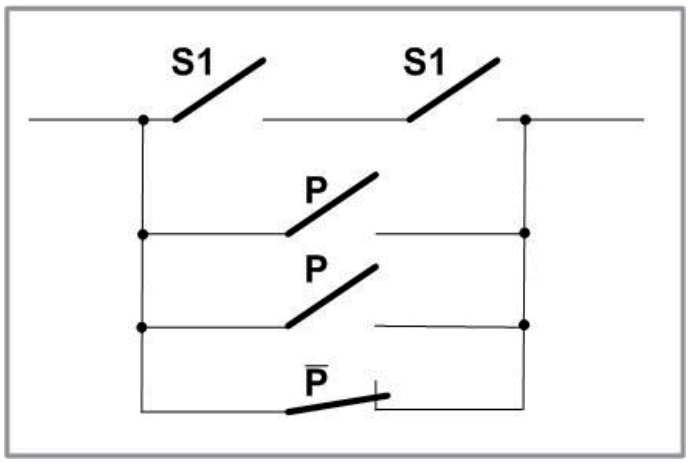


Figure 17: Series S1 branch connected in parallel with parallel P branch

Two series branches - S1 and S2 - connected in parallel with parallel P branch

As shown by the equivalent circuit in Figure 18, the upstream series circuit is always represented by S2 switch contacts whereas the downstream series circuit which is connected in a parallel with the parallel P branch is always represented by S1 switch contacts.

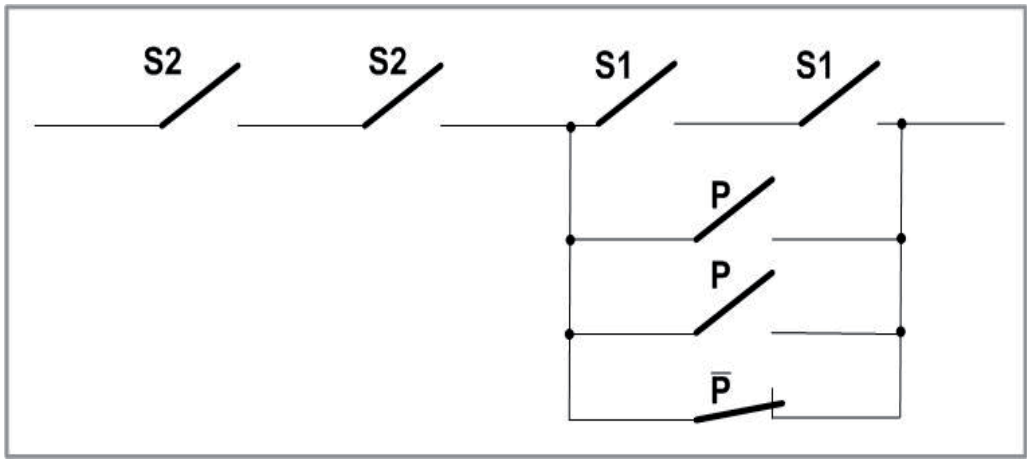


Figure 18: Two series branches - S1 and S2 - connected in parallel with parallel P branch

In certain circuit combinations, S1 may have the same effect as P, and S1 and S2 may have the same effect as shown in Figure 19.

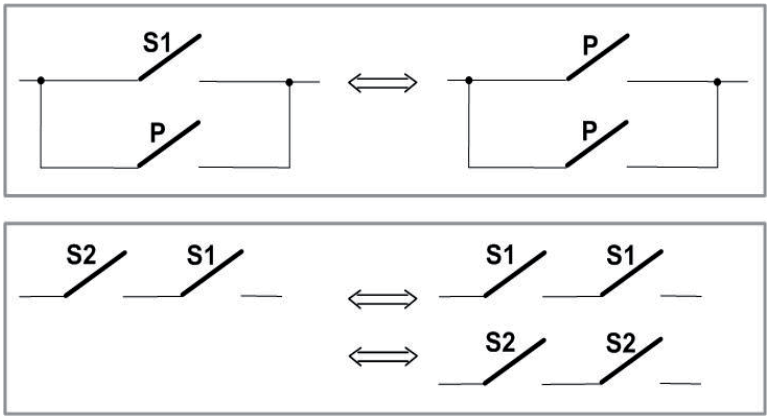


Figure 19: S1, S2 and P: different and identical properties

AND Function

The AND function is implemented using switches with S1 or S2 serial characteristics. In the following example, all switches normally open switches must be operated, i.e. closed, in order to activate the assigned output.

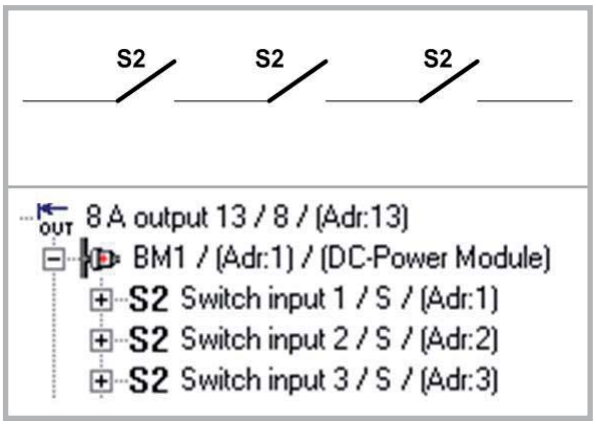


Figure 20: AND function using S2 switches connected in series

OR Function

The OR function is implemented using switches with P parallel characteristics. In the following example, at least one of the normally open switches must be operated, i.e. closed, for the connected output to be activated.

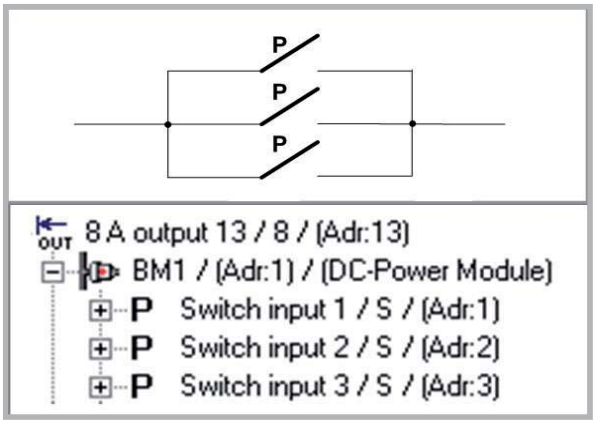


Figure 21: OR function using P switches

Other Equivalent Circuits (Examples)

The following example shows 4 inputs logically linked using S2 and P type switches.

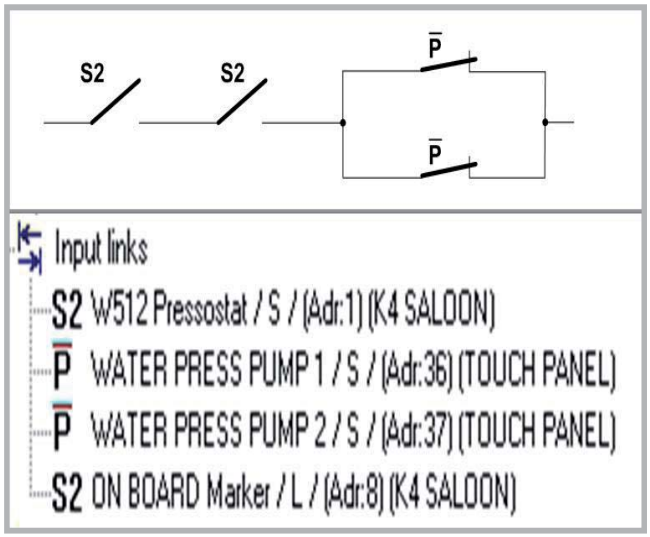


Figure 22: Equivalent circuit of logic switch combination (Example 1)

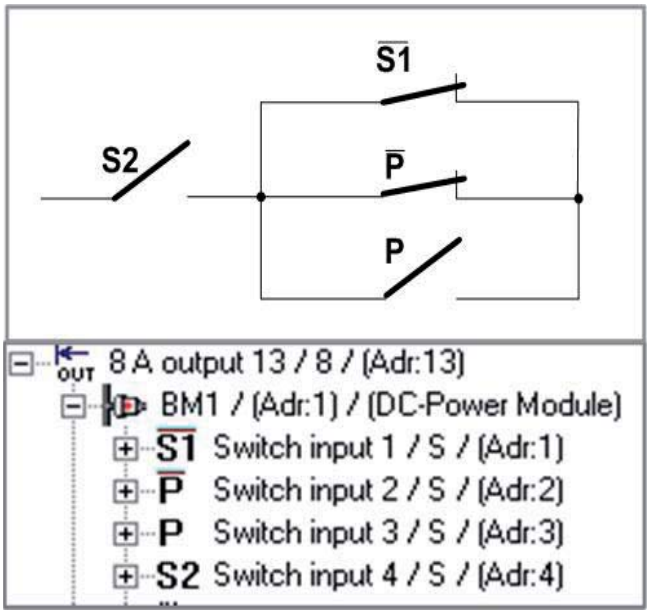


Figure 23: Equivalent circuit of logic switch combination (Example 2)

5.5 Analog Inputs

5.5.1 Analog Inputs as Switch Inputs

Both types of PowerPlex modules offer a defined number of analog inputs:

- DC Power Module: 12 analog inputs
- Panel Module: 6 analog inputs

These analog inputs can be defined as genuine analog value measurement points or as analog inputs possessing switching capabilities. In the latter case, the analog input generates a switch action as soon as a defined limit value - the threshold - is measured at its input.

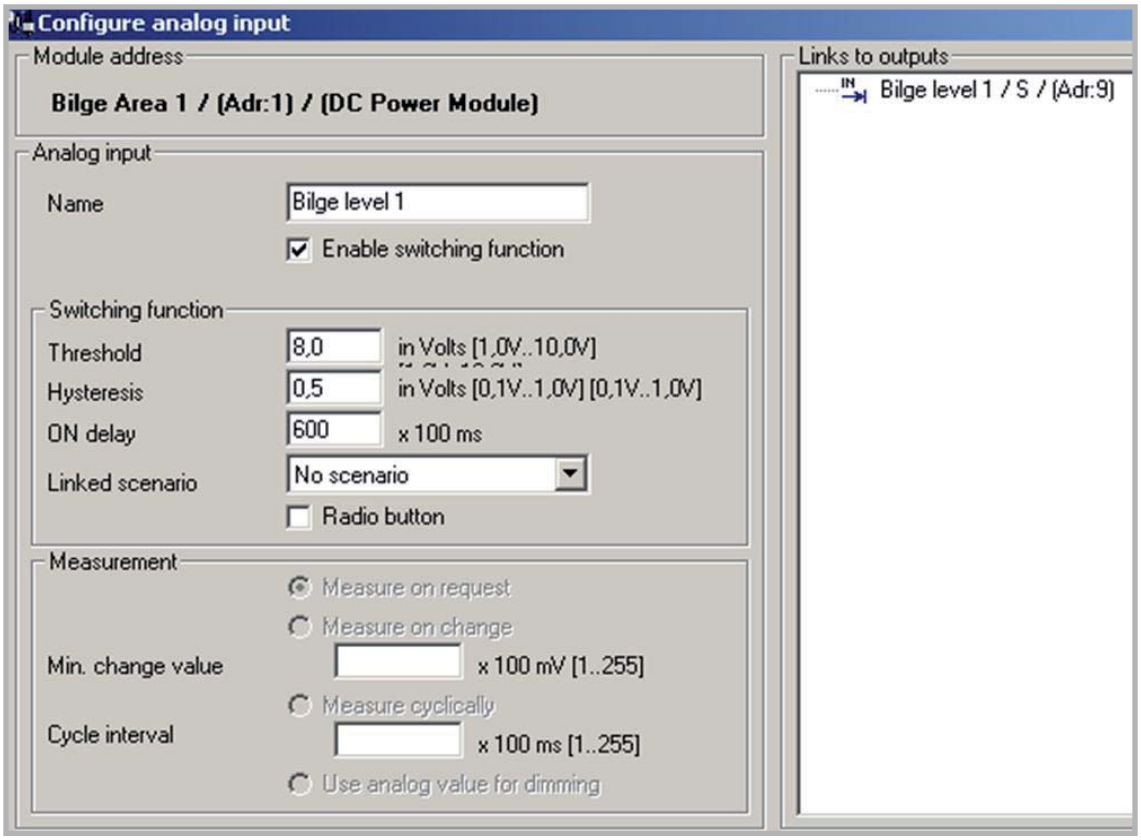


Figure 24: Analog input specified as switch input

Analog Input: Parameters

Parameters	Description
Name	Name of the input. Advice: type in a meaningful designation which allows you to identify the purpose of the input and the location of the assigned device.
Enable switching function	If enabled, this function converts the analog input into a switching signal which may be used to switch a device, here the Bilge pump, as soon as a predefined limit value has been reached.
Threshold	Limit value in the range of 0 to 10 V. A value above this threshold triggers the switching function, i.e. a logic "1" signal.
Hysteresis	Difference between ON and OFF voltage signal with respect to the threshold value. Avoids constant switching from logic "1" to "0", and vice versa, if there are only small voltage changes arount the threshold value. Example: Threshold = 8 V, Hysteresis = 0.5 V → ON at 8 V, OFF at 7.5 V
ON delay	The ON signal is delayed by this value after the threshold has been reached. Example: ON delay = 600 (= 600 x 100 ms) = 1 minute. → If input signal ≥ 8 V AND a period of 1 minute has elapsed, then ON signal!
Linked scenario	see Special Functions, → Chapter 6.
Radio button	see Special Functions, → Chapter 6.
Measurement on request	The measurement function of the analog input signal is implemented in connection with the Touch PC software and an external computer. If used as a measurement input (i.e. the switching function is not enabled), the input measures values from 0 to 10 V or 4 to 20 mA (→ Manual, Volume 2).
on request	The value is read in and stored upon request, e.g., upon a Touch panel command.
on change	The measured electrical quantity (V or mA) is read and stored each time a change in the value is detected.
cyclically	Cyclical measurement of the monitored value.
Min. change value	Defines the minimum change that has to occur in the measured value for the value to be read and stored if measurement is set to "on change".
Cycle interval	Interval at which the value is measured if measurement is set to "cyclical".
Use analog value for dimming	Enable if you want to connect this analog input to an 8 A or 25 A output. The voltage 0 V to 10 V controls the brightness in the range from 10 % to 100 %.

5.5.2 Analog Inputs for Current Measurement

The module's analog inputs can be used for voltage and current measurement. DC Power Modules offer 12 analog inputs. The first four of these are connected to the external terminals A1 to A4 and allow you to implement a voltage measurement in the range from 0 to 10 V.

The remaining 8 analog inputs - input no. 5 to input no. 12 - serve for internal current measurement of the 8 A and 25 A power outputs. These analog inputs are internally linked to the corresponding power output terminals 81, 82 ... 86 for six 8 A power outputs, and to the 251, 252 terminals for two 25 A power outputs, i.e. the 5th analog input relates to the 1st 8 A output, the 6th to the 2nd 8 A output and so on. These analog inputs internally represent the output current of the power output they relate to. Their special task is to monitor the associated power output for correct current flow. This analog input / power output relation is predefined and fixed; it is therefore not possible to assign these analog inputs to anything else.

Application Example
A simple application would be to monitor a bilge pump using an internal float switch. The pump is powered via PowerPlex. However, the associated power output activates the pump's power supply rather than the pump itself. Although the pump's power supply may be ON, it is not absolutely sure that the bilge pump is actually running. Therefore it is quite useful to have an anlog input measure the current flowing through the power output driving the pump.

For this application, the switching function of the analog input is enabled in the **Configure analog input** dialog, and a threshold is defined which triggers the switching action. Here, the pump's rated current is 2 A, so the threshold is set to this value. The hysteresis value of 0.1 A prevents intermittent ON / OFF switching.

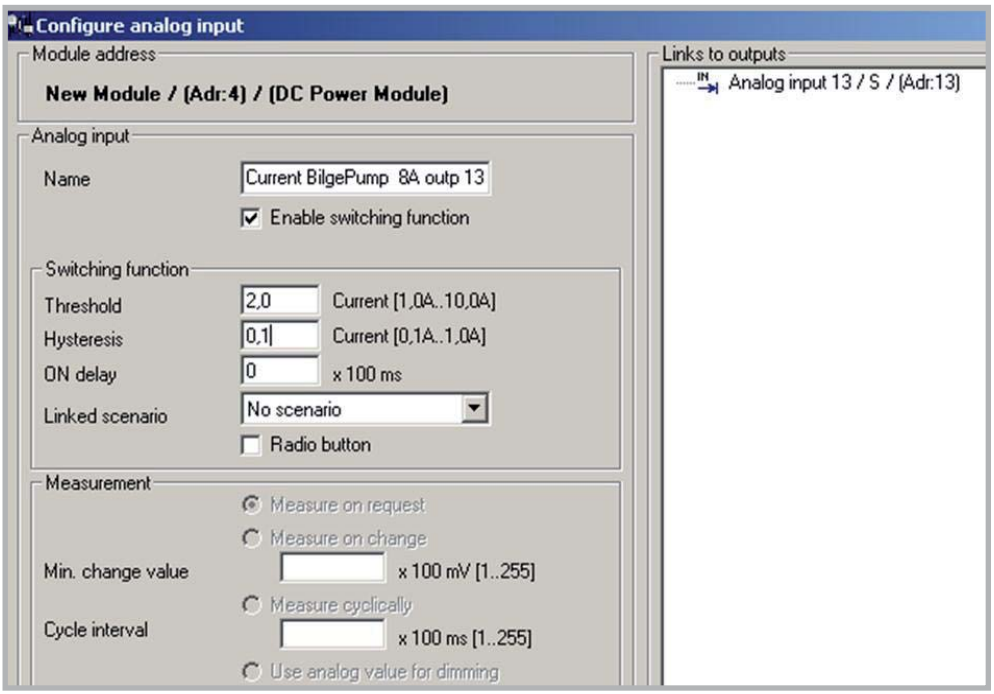


Figure 25: Analog input for current measurement

When the pump is activated by its float switch, the current will rise to 2 A. At this point, the analog input is activated. If it is linked to a signal output, this signal output will indicate "Pump running". In connection with the E-T-A Touch PC software it is possible to assign a bilge monitor to this analog input in order to obtain more detailed information on the pump's operation, such as operating hour counts, bilge alarm and some statistic data regarding the rate of activity of the pump.

Note:
With the switching function enabled, these analog inputs can be used as switch inputs without any restrictions, in the same way as standard switch inputs (→ Chapter 5.4).

5.6 Inputs as Radio Buttons

All inputs have a checkbox called “Radio button”. This feature allows you to create a radio button group. This is a group of inputs all of which are defined as LATCHED (N.O. latched or N.C. latched) and as radio buttons. Inputs that belong to a radio button group act as options in a group, i.e. they deactivate each other: activating one switch of the group automatically deactivates the others.

This function reminds us of the physical selection buttons used on older car radios to select preset stations - when one of the radio buttons was pressed, the other buttons would pop out, leaving the pressed button the only button in the "pushed in" or "activated" position.

Configuring the radio button function requires some consideration and the configuration should be tested thoroughly.

Example of a radio button group:

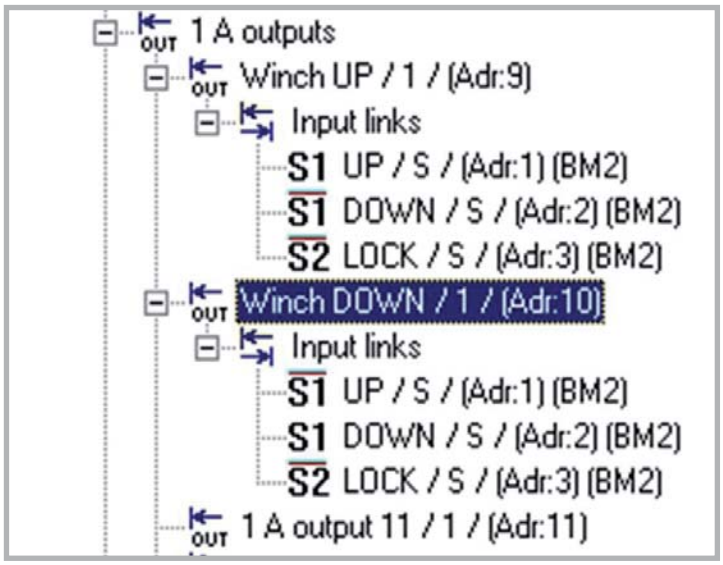


Figure 26: Radio button group

Three switches named UP, DOWN and LOCK are connected to two outputs: Winch UP and Winch DOWN.

All three switch inputs have their radio button function enabled. Each switch input of the radio button group is connected to an output which has one of the other radio button inputs connected to it.

Important:

It is mandatory that ALL switches of a radio button group are connected to ALL loads that are controlled by this group of buttons.

5.7 Power Outputs

PowerPlex modules provide a number of power outputs that can be directly connected to the boat's electrical equipment, such as lighting, pumps, motors, and so on. The DC Power Module offers four outputs for 1 A loads, six outputs for 8 A loads and two outputs for 25 A loads.

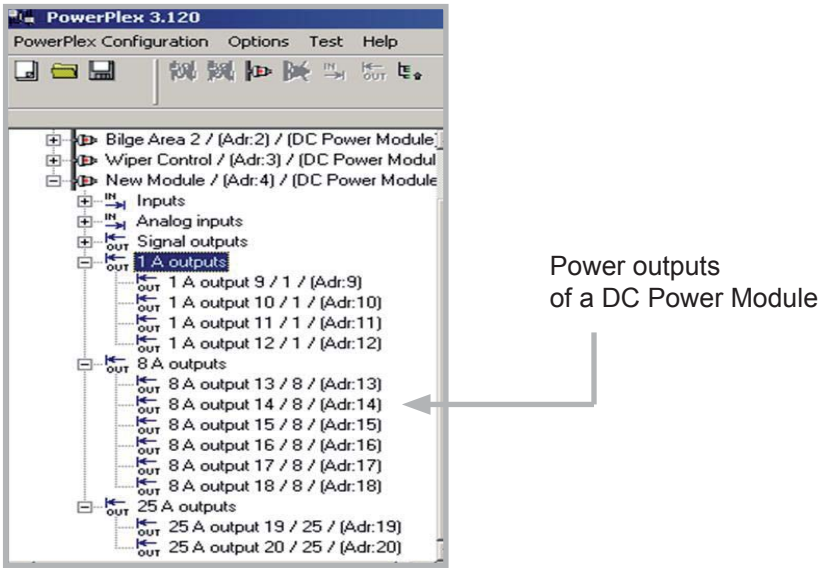


Figure 27: Power outputs of a DC Power Module

The power outputs' properties are defined in the **Configure power output** dialog.

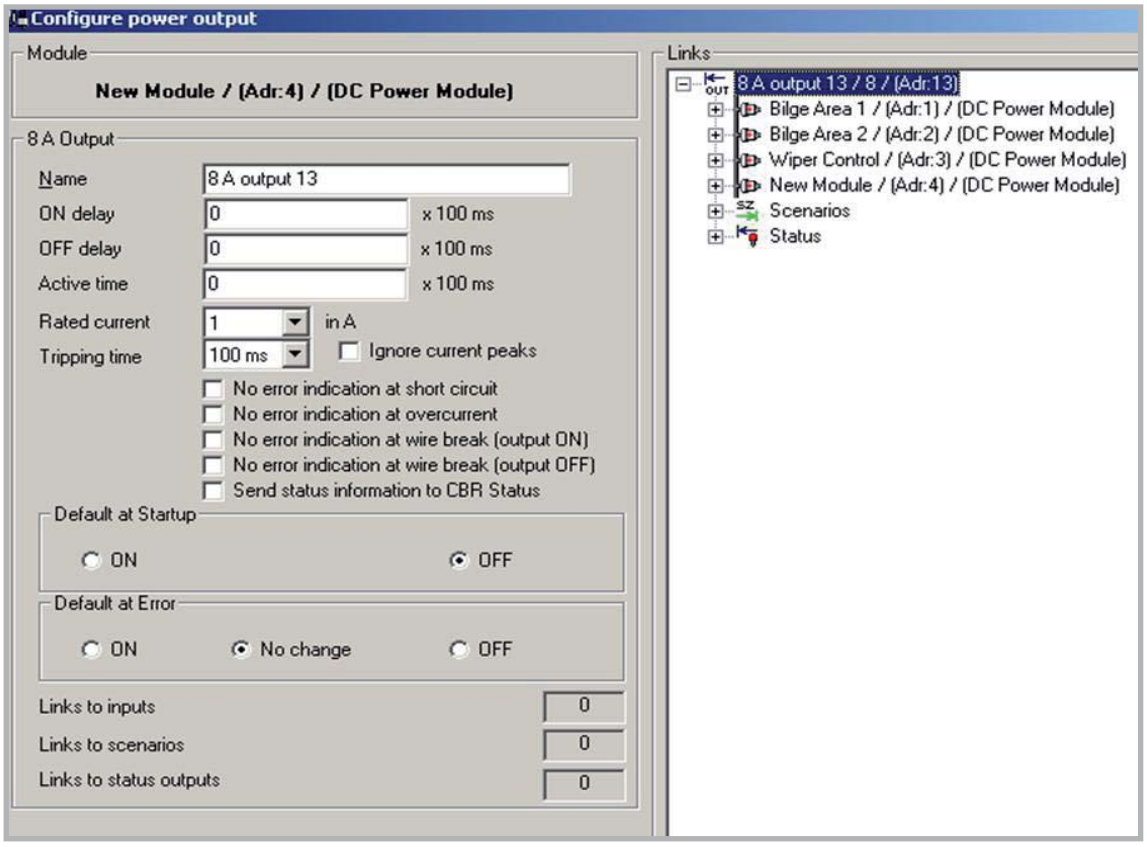


Figure 28: Properties of a power output

Power Output: Parameters

Parameters	Description
Name	Name of the output. Advice: type in a meaningful designation which allows you to identify the purpose of the output and the location of the assigned device.
ON delay	You can define an ON delay for the power output in steps of 100 milliseconds in the range from 0 to 65535 (~109min max.). If an ON delay is specifed (i.e. value > 0), no value can be entered for **Active time**.
OFF delay	You can define an OFF delay for the power output in steps of 100 milliseconds in the range from 0 to 65535 (~109 minutes max.). If an OFF delay is specifed (i.e. value > 0), no value can be entered for **Active time**.
Active time	Maximum ON time; it defines for how long the power output is to remain active after its power up. The output will automatically de-energize, when this active time has elapsed, or when the output is switched off. Enter "0" if you do not want the power output to de-energize automatically after a certain delay. If an active time is specified (i.e., value > 0), then neither ON nor OFF delay can be defined.
Rated current	Here you can increase the maximum current rating for the power output. Select the value from the drop-down list taking into account the expected power consumption of the connected load. Default values are 1 A (8 A power output) and 10 A (25 A power output).  Make sure that the maximum current you select here is not too high as this may hinder reliable overload detection.
Tripping time	You can specify a tripping time in milliseconds or seconds for which the power output may exceed the specified max. current rating. The drop-down list only offers acceptable values.
Ignore current peaks	Some electric loads, such as fans and speed control devices, generate current spikes at power-up. These could trip short-circuit protection mechanisms at the wrong moment. Hence, enable this function if you want to admit these initial current peaks and prevent inadvertant circuit breaker tripping.
Default at Startup	Specify the default status the power output should assume upon system startup. You can choose between ON and OFF..
Default at Error	Specify the default status the power output should assume in the event of an error. You can choose between ON, No change, and OFF.

5.8 Power Output Protection

All 8 A and 25 A power outputs of your PowerPlexSystem are protected against wire break, overcurrents and short circuits.

5.8.1 Wire Break Detection

It is common practice to apply a test current to a power output while it is in the OFF state in order to detect possible wire breaks. However, whether this is a reliable method largely depends on the electrical properties of the power output circuit; some loads do not admit any current flow when de-energized.

PowerPlex therefore allows you to decide whether for a particular power output you wish to enable or disable wire break detection. This decision is made in the **Configure power output** dialog.

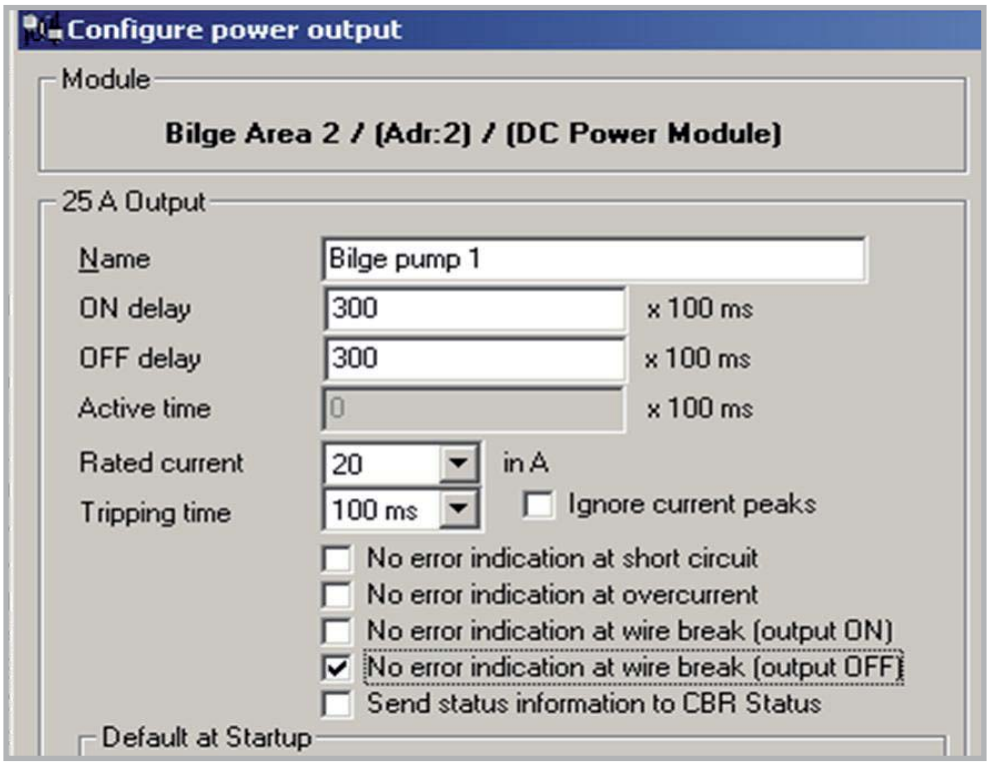


Figure 29: Output properties

Power output	Wire break detection	Required electrical properties
8 A	(output ON) (output OFF)	In the ON status, there is a current flow of < 200 mA . In the OFF status, there is a load resistance > 100 Ω.
25 A	(output ON) (output OFF)	In the ON status, there is a current flow of < 500 mA. In the OFF status, there is a load resistance of > 100 Ω.

Table 5: Wire break detection: Conditions for enable / disable at ON and OFF status

Response to wire break detection

Wire break detection enabled:	In the event of a detected wire break, the connected and linked status LEDs flash at low frequency and the affected power output is de-energized.
Wire break detection disabled:	In the event of a wire break, nothing happens → no status LED indicates the fault, neither will the affected power output be de-energized.

Note:

If a wire break occurs in an output circuit with wire break detection disabled, neither a status message will be issued nor will the power output be deactivated.

5.8.2 Overcurrent and Short-Circuit Detection

8 A and 25 A power output circuits can be monitored for short-circuit and overload faults. The PowerPlex default setting enables fault indication in these situations. You may disable fault indication in the **Configure power output** dialog by checking the boxes **No error indication at short circuit** or **No error indication at overcurrent,** respectively (see dialog box on the left page).

If you disable overcurrent and short circuit error indication for a power output, the allocated status LED will not indicate such a fault should it occur. However, the affected power output will be de-energized.

Note:

A power output will always be deactivated in the event of overcurrent or short circuit, even if overcurrent or short circuit error indication has been disabled in the **Configure power output** dialog.

5.8.3 Reactivating Power Outputs After Error Correction

Once the cause of the short circuit, overload or wire break has been removed, the interrupted power output may be reset.

There are three ways of reactivating the power outputs:

1. **System Restart**
   Disconnect the entire PowerPlex system from the operating voltage / battery voltage and then restart it. Upon restart, all power outputs will be available again and set to the specified default switch position.

2. **Individual Switch Reset**
   In addition to its interruption triggered by the system's fault protection function (i.e., short circuit, overload or wire break protection), the affected power output is deactivated by means of a switch or button assigned to it. In this case, operating this switch or button automatically reactivates the power output.

3. **Common Breaker Reset (CBR)**
   Perform a Common Breaker Reset (CBR), i.e. a general reset of all interrupted 8 A and 25 A power outputs using the common reset button assigned to this function. All power outputs will be available again and set to the specified default position.

5.8.4 Default Status of a Power Output upon System Start or Error

Upon a system restart or a power output reset following a fault situation, the affected power outputs assume the status which was specified as default in the **Configure power output** dialog.

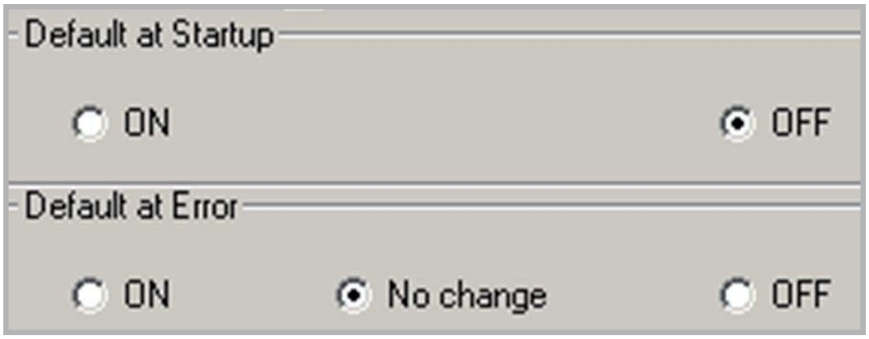


Figure 30: Default status of a power output upon system start or error

In the **Configure power output** dialog you define the output's response to a system restart or startup, i.e. whether it should assume the ON or the OFF position when restarted.

Similarly, you define the output's response to a reset after interruption due to a fault (i.e., short circuit, overcurrent or wire break): it may assume the same status as it had prior to the fault, or it may be reset to the ON or OFF condition.

5.9 Signal Outputs

5.9.1 Signal Outputs as Status Indicators for Power Outputs

Signal outputs are normally connected to LEDs which in turn have the task of indicating an on/off or OK / fault situation.

However, signal outputs are quite versatile. Just like any normal 1 A, 8 A or 25 A power output, signal outputs, too, may be directly linked to switch inputs. If assigned directly to a power output, a signal output can serve as a status indicator for this power output. This connection is made in the **Configure power output** dialog (→ 9.9).

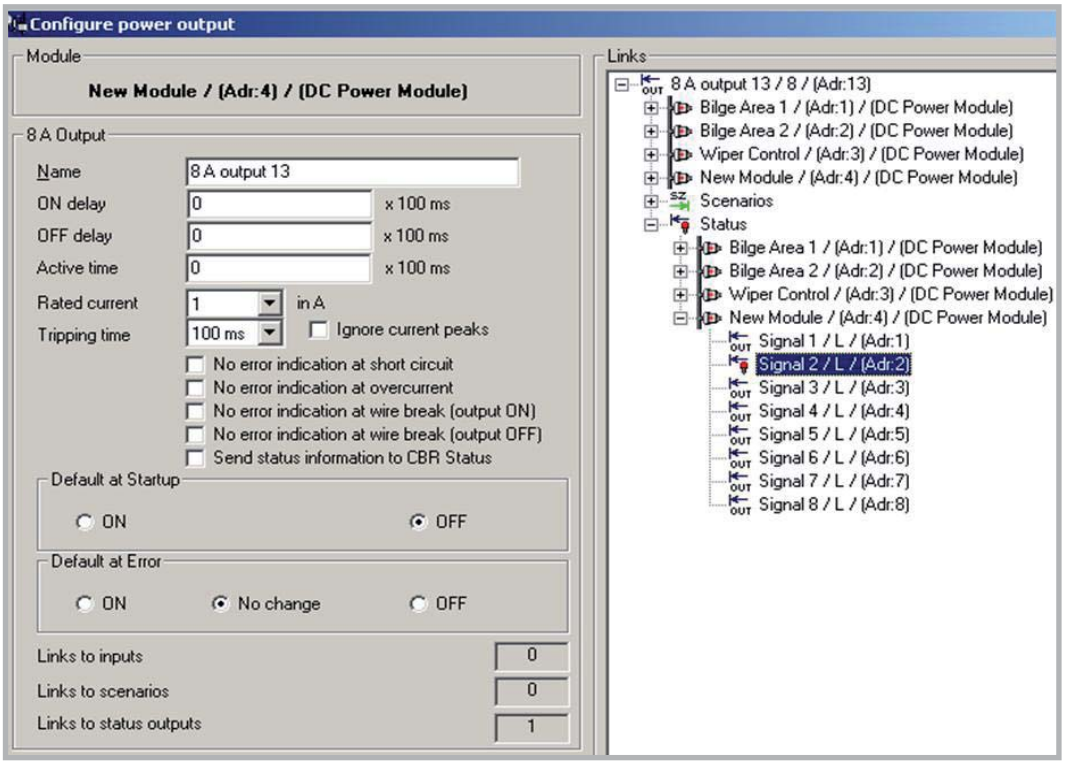


Figure 31: Assigning a status output to a power output

In the **Links** window on the right, the lowest branch of the power output is the **Status** branch. To be able to see it, you may have to scroll down or collapse the upper branches. Double click the signal output you wish to assign to the power output. The assigned status output will now be indicated by a small red bulb symbol. This link between the signal output and the power output will also be displayed in the configuration browser on the left.

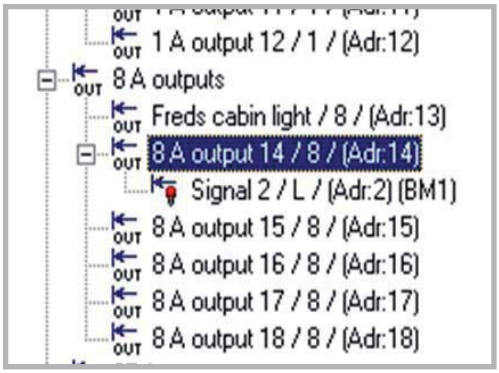


Figure 32: Signal output as status indicator for power output

5.9.2 Signal Outputs as Markers or Memory Flags

Contrary to the other output types, signal outputs may also take up the role of inputs. If used as inputs, they can serve as markers (memory flags).

The use of markers or memory flags helps to overcome the restriction of maximum 6 links for every output. To do so, you just assign up to six inputs to a signal output, and then assign this signal output to a power output.

Example: Simple alarm function

The signal output labelled “Alarm start” is connected to switches and sensors, i.e. to inputs. Next, the “Alarm start” signal output is assigned to the output called “Alarm Signal”. Another input called “Enable Alarm” is linked S2 to the same output via S2. This switch input is used to deactivate or activate the alarm function.

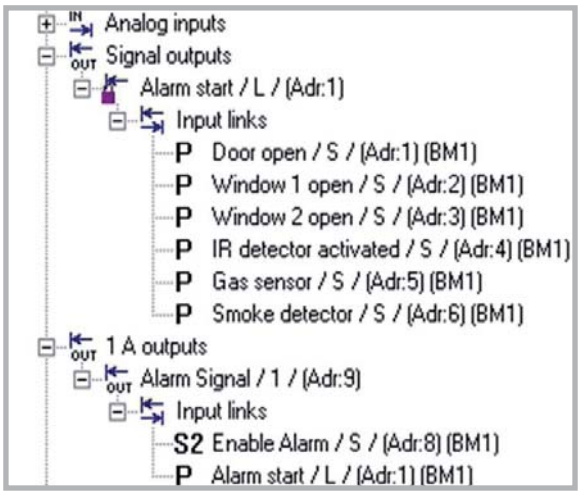


Figure 33: Signal outputs as memory flags (example: Alarm function)

5.9.3 Cascading Signal Outputs

Signal outputs may be cascaded. However, do take into account that it may take up to 200 ms until a signal output is actually activated over the CAN bus. It is good practice to only cascade signal outputs that are located on the same module. This reduces delays to a minimum and makes the cascading function independent of the communication load on the CAN bus.

5.9.4 Signal Outputs for Relay Control

As the signal outputs are capable of driving LEDs, they may also be used for driving opto-coupled solid state relays. These in turn can then be applied to control power relays of high current rating or AC relays.

If signal outputs are used for the control of relays, it is mandatory to set the “LED Brightness Nightmode” dimming value of the module involved to the value "10", i.e. to 100 %. This avoids malfunctioning when the nightmode is activated.

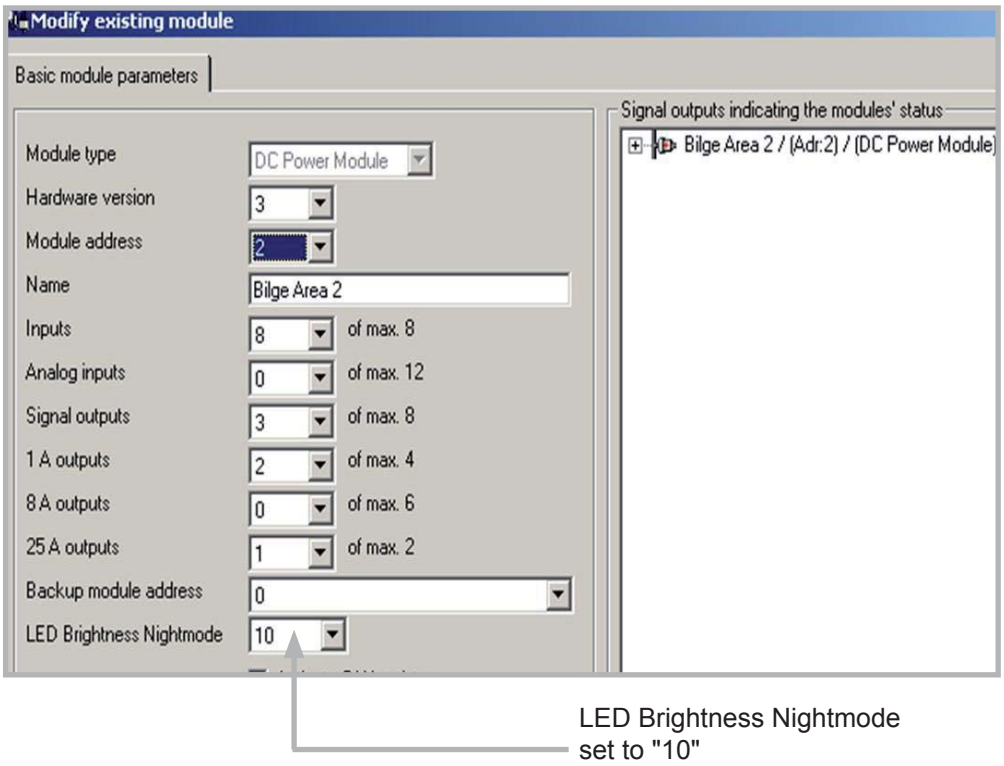


Figure 34: LED Brightness Nightmode set to "10"

Note:

The marker function of signal outputs (→ 5.9.2) is not affected by the relay control feature.

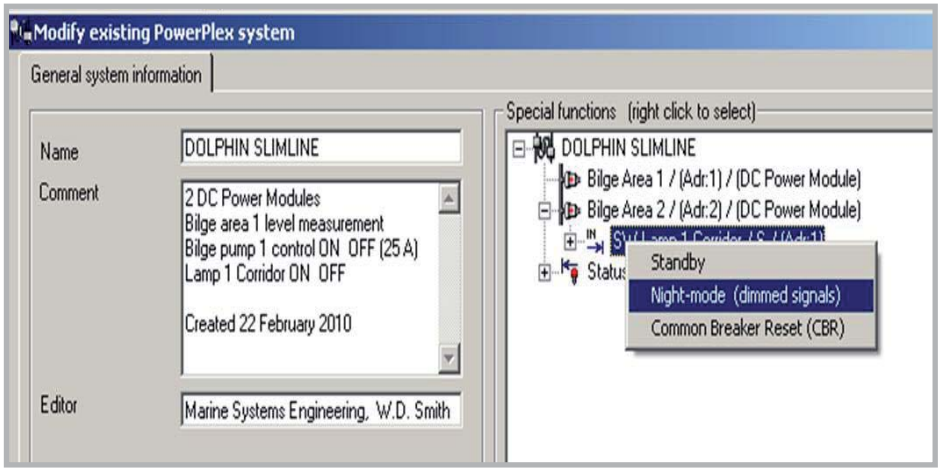
6. System Parameters and Special Functions

System parameters are special functions that may affect the behaviour of the entire PowerPlex system you have configured, or of certain parts of it. Although a special function is usually assigned to one or several specific inputs which initiate the function, it may affect the entire system. The following system parameters are available:

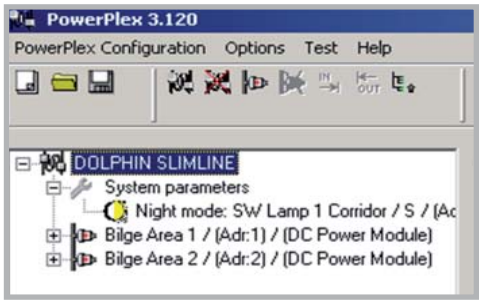
- Standby mode
- Night mode
- Common Breaker Reset (CBR)

6.1 Defining the System Parameters (Special Functions)

Step	Action
1	In the PowerPlex browser on the left, select the PowerPlex configuration. Double click, or right click to open the context menu and select the **Modify configuration** option. Alternatively, you may use the toolbar symbol **Edit PowerPlex configuration** 
2	In the **Modify existing PowerPlex System** dialog, expand the tree view in the **Special functions** window.
3	Right click the switch input which is to assume a special system function. In the context menu, select and click the function you wish to assign. The switch input is now highlighted by the symbol of the special function assigned to it. Confirm with **O**K.



4	In the browser on the left, you will now see the rubric **System Parameters** with the newly assigned special input function.



5	Save the configuration in the project file.

Special input functions context menu

Special input function	Description
Standby (→ section 6.2)	The selected switch input puts the PowerPlex system into standby mode. This switch must also be operated to reactivate the PowerPlex system, i.e. to reset it from standby to normal operating mode. This means the switch input responsible for activating the Standby mode acts as a toggle switch.
Night-mode (dimmed signals) (→ section 6.3)	The selected input sets all signal outputs into the night mode. The light brightness during night mode can be specified separately for each module. You must also use this switch to reactivate the outputs, i.e. to reset them from night mode to day mode.
Common Breaker Reset (CBR) (→ section 6.4)	The selected input resets all outputs that have been deactivated due to a failure, such as wire break, overload or short circuit..

Table 6: Special input functions (system parameters)

The following sections describe these special functions in more detail.

6.2 Standby Mode

In standby mode, all power outputs are switched OFF in order to reduce the modules' power consumption to a minimum.

You will typically give one switch input the role of the **Standby** switch. This switch will act as a toggle, i.e. the same switch resets the PowerPlex system to the normal operating mode in which the power outputs can be switched on and off again as required.

Note:

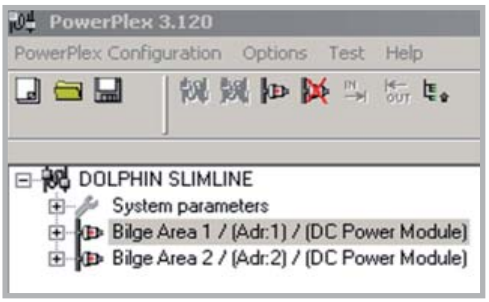
The switch input that activates the Standby mode acts as a toggle, i.e. the same switch reactivates the PowerPlex system and resets it to the normal operating mode.

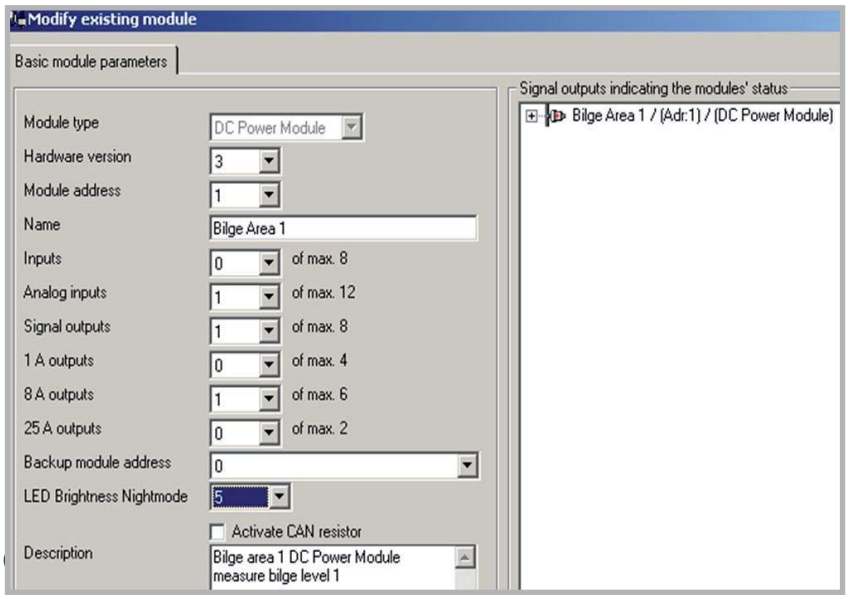
6.3 Night Mode (Dimmed Lights)

You may give one switch input the role of a "Night switch" (→ section 6.1. "Defining the System Parameters (Special Functions)". This night switch will reduce the brightness of all signal outputs to a predefined minimum.

You define the night brightness of all signal outputs of a specific module when you define or modify the characteristics of that module:

Step	Action
1	In the PowerPlex browser on the left, double click the module whose signal outputs you wish to dim at night.
2	In the **Modify existing module** dialog, set the value for **LED Brightness Nightmode** to the required brightness at night. Range: 10 (default value, no dimming) to 1 (lowest brightness), in steps of 1
3	





Note:

The switch input that activates the Night mode acts as a toggle, i.e. the same switch reactivates the day mode in which all lights previously dimmed return to their normal day brightness.

6.4 Common Breaker Reset (CBR)

A Common Breaker Reset (CBR) can be defined for the circuit-breaker protected power outputs, i.e. for the 8 A an 25 A power outputs (→ section 6.1)

This common reset function is a switch input that resets all tripped power outputs simultaneously with one switch action. This is particularly useful if a larger number of power outputs had been disconnected by their protective circuit breakers due to wire break, overcurrent or short circuit.

Note:

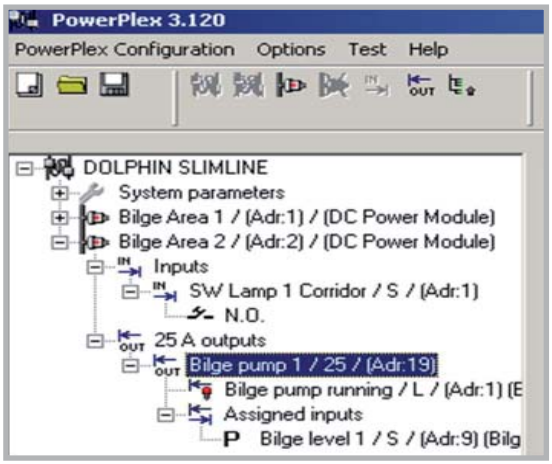
The Common Breaker Reset function should be connected to a momentary-type switch or pushbutton. You may define only one CBR button in your PowerPlex system.

The CBR button always resets **all** of the tripped 8 A and 25 A power outputs of the PowerPlex system; it is therefore not necessary to explicitly assign the power outputs to be involved to the CBR function.

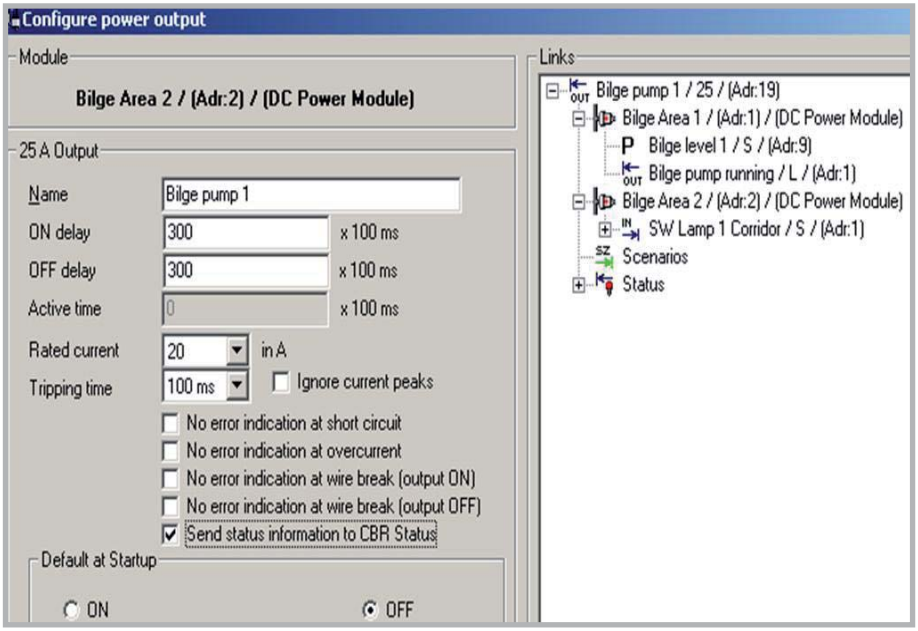
The error states of individual power outputs, however, you may assign to the global CBR status. This has the effect of collecting the power outputs' error information at a central point so that it can be displayed together with the CBR status.

6.4.1 Assigning Power Output Errors to the CBR Function

Step	Action
1	In the PowerPlex browser on the left, expand the module's outputs and double click the power output whose error information you wish to include in the CBR status display.



2	In the Configure output dialog, check the parameter box **Send status information to CBR Status.**



3	Confirm with **OK** and save your configuration.

6.4.2 CBR Status Indication

The Common Breaker Reset function provides an integrated LED called CBS (**C**ommon **B**reaker **S**tatus). The CBS LED informs about the error states of all power outputs whose error information has been included in the CBR status display (→ 6.4.1, " Assigning Power Output Errors to the CBR Function").

The CBR status LED indicates the nature of the fault that has caused the circuit breaker to trip and interrupt the power output. If several power outputs in the PowerPlex system enter into a fault status and trip a circuit breaker at the same time, then the faults are indicated according to their priority, as shown in the table below.

Priority	Error status	Indication
1	Short circuit	Maximum flashing frequency
2	Overcurrent	Fast flashing
3	Wire break	Slow flashing

Figure 35: CBR Status LED: Error indication priority

Example:

The system has detected three faulty power outputs - one caused a short circuit, one was deactivated due to overcurrent, and one was disconnected from the PowerPlex system due to a broken wire.

The CBR Status LED starts flashing at highest frequency and continues flashing at this frequency until the short circuit has been removed and the CBR button has been pressed. The short circuit fault is now corrected and the associated power output is reset. As the other faults are still present, the CBS status LED is now flashing at the fast frequency to indicate the overload situation. Only if the overload situation has been corrected and a common reset performed, will the CBS status LED flash at the slowest frequency to indicate the remaining fault - the wire break.

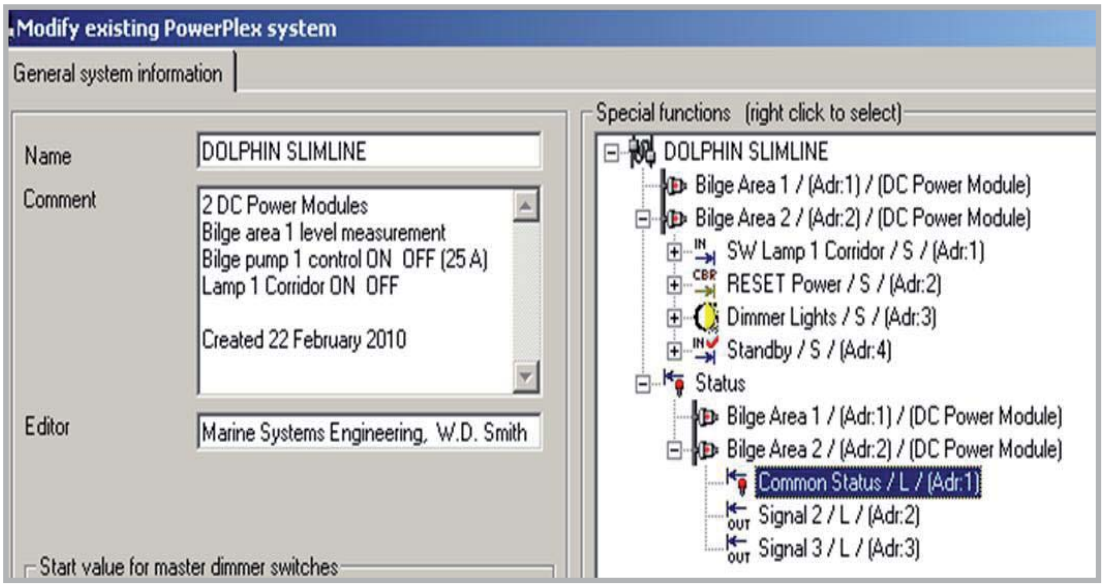
Note:

The CBR Status LED shows a steady light until the boot process of the PowerPlex system is completed and all system functions are available.

6.4.3 Assigning a Signal Output to the CBR Status LED

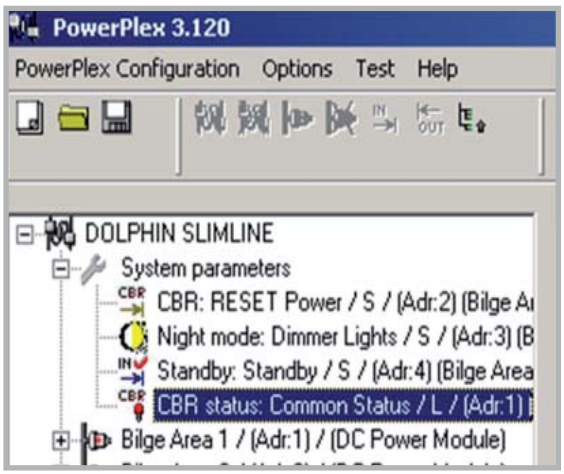
To have an LED indicating the CBR Status you have to assign a signal output to the CBR Status function.

Step	Action
1	You require a **signal output** for this function, so make sure you have a free signal output available.
2	In the browser, double click the name of the PowerPlex configuration.
3	In the **Modify existing PowerPlex System** dialog, in the **Special functions** window on the right, expand **Status** in the tree view.
4	Double click the status signal you wish to assign to the CBR Status LED. The status input is now indicated by a red bulb symbol.



To undo the assigned function, just double click the status input again (toggle function).

5	Click **OK** to confirm your settings, and save your configuration in the project file.
6	The browser on the left will now show the system parameter CBR status.



7. Scenarios

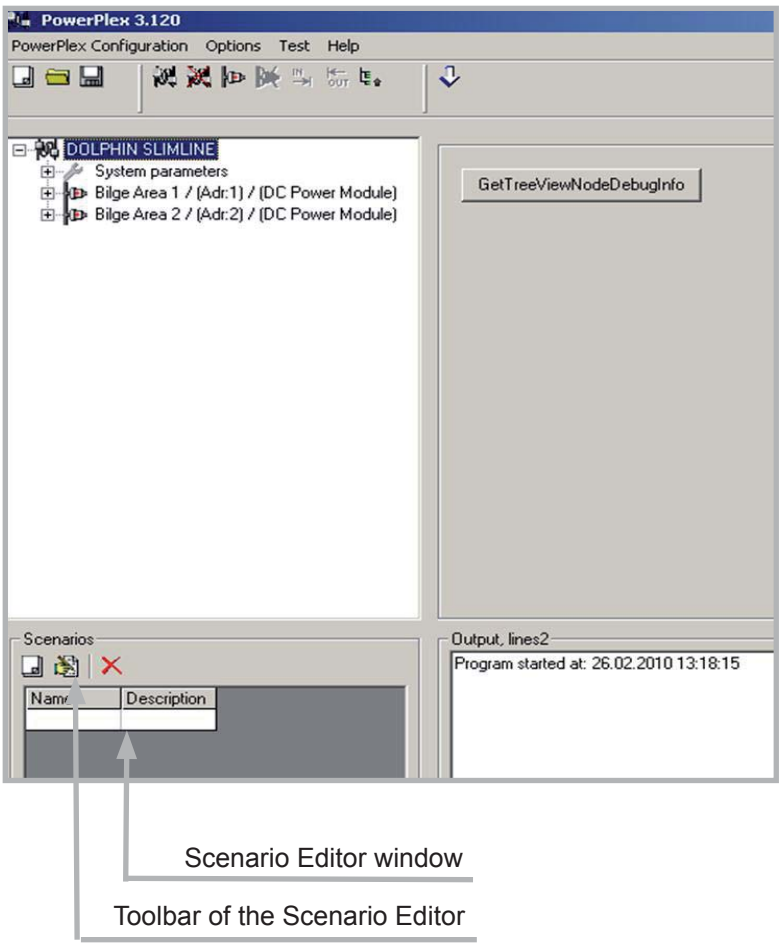
You can use a "Scenario" to link inputs with specific power outputs that will then be activated/deactivated together with the linked input. In this way you can define your own switching sequences that take effect in certain situations.

A scenario called "Shore leave", for example, could be configured to automatically turn on the exterior lights and the alarm system as soon as you press the pushbutton for turning off all interior lights.

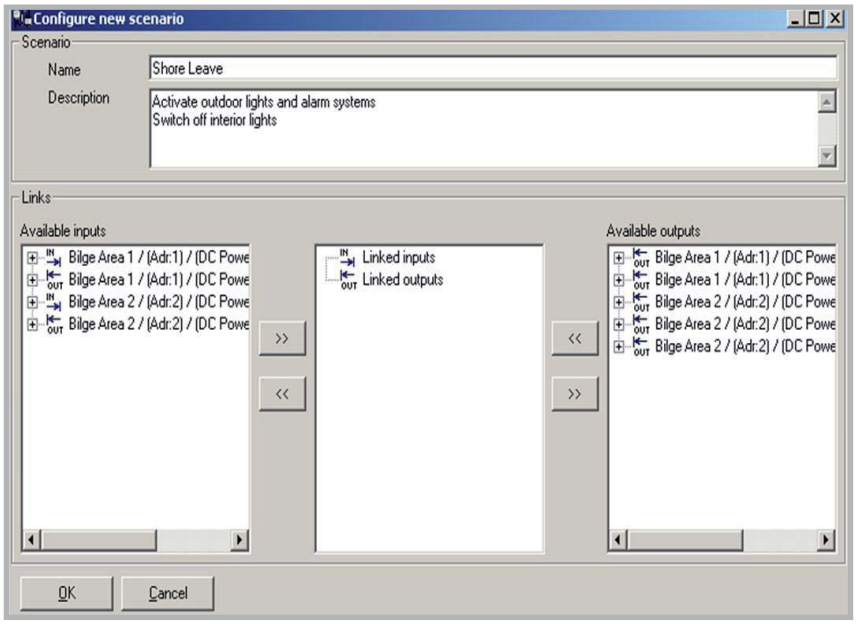
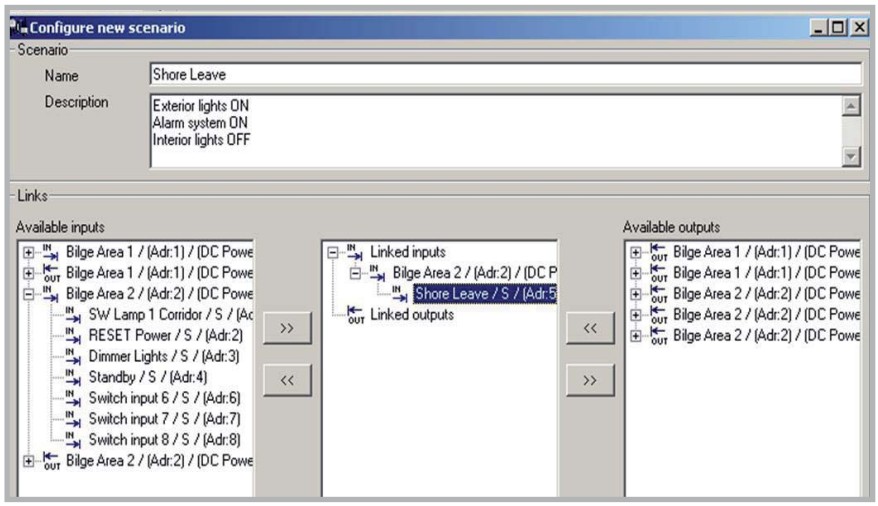
7.1 Scenario Editor

PowerPlex offers a special Scenario Editor which assists you in creating and editing your own switching scenarios.

You open the **Scenario Editor** in the main window of the PowerPlex configuration.



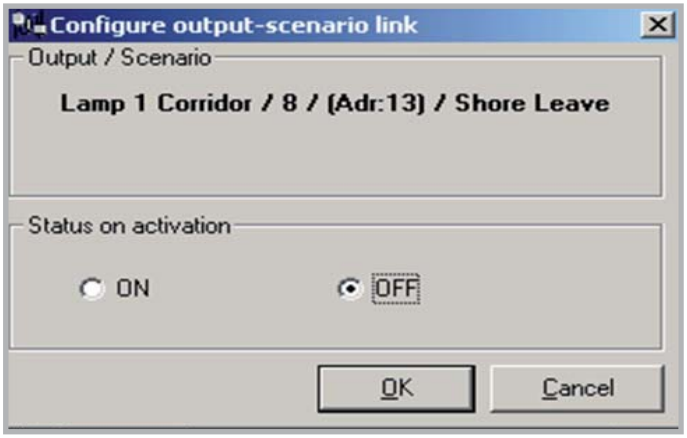
7.2 Creating a New Scenario

Step	Action
1	In the Scenario editor, in the toolbar, click the **Create a new scenario** button. 
2	In the **Configure new scenario** dialog box, specify a name for the new scenario and type in a description of its purpose. 
3	All modules and their inputs and outputs available for inclusion in a scenario are listed in the **Available inputs** and **Available outputs** windows.
4	Assign an input, for instance, the **Shore Leave** switch input, to the scenario by double clicking it. It will automatically move from the **Available inputs** list on the left to the centre window listing the linked inputs and outputs. 

To undo this assignment, simply double click the input in the centre window, or use the double arrow buttons on the left to return the assigned input to the **Available inputs** list.

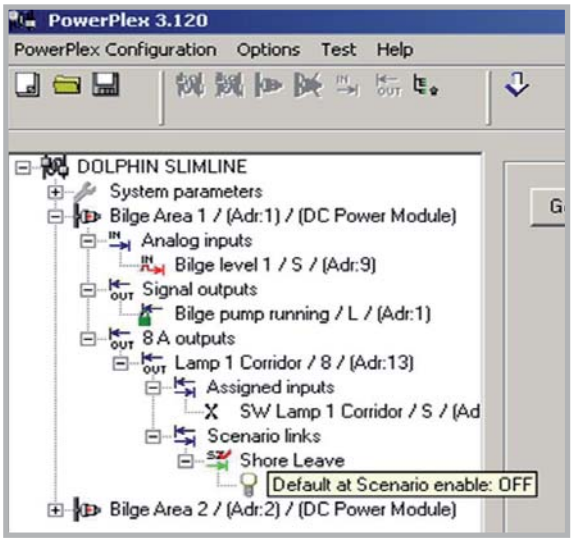
Step	Action

5 Now, assign an output, for instance the **Lamp 1 Corridor** power output, which should be switched off when the **Shore Leave** switch is operated. This output is moved into the centre window, under **Linked outputs**. Double click it to specify which status the output shall assume when the scenario is triggered. Here: the interior corridor light shall be switched off by the **Shore Leave** switch.



Confirm with **OK**. Next, save the new scenario by pressing the OK button.

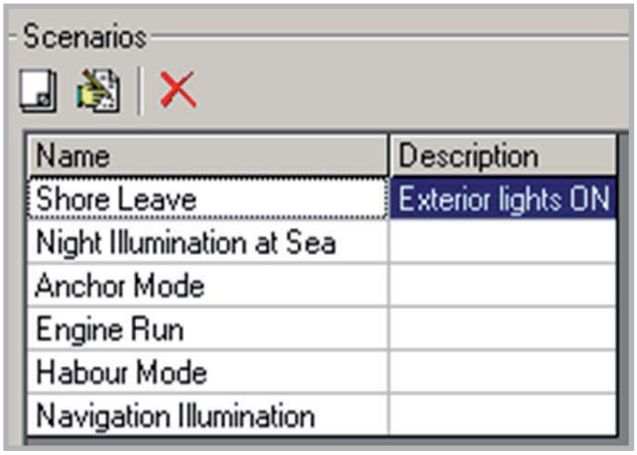
6 In the PowerPlex browser, the new scenario characteristics of the power output **Lamp 1 Corridor** are now indicated by the rubric **Scenario** and a light bulb (yellow bulb symbol for output ON, white bulb symbol for output OFF).



Save the modified configuration.

7.3 Modifying an Existing Scenario

Step	Action
1	In the Scenario editor, in the list of existing scenarios, select the scenario you wish to modify.



2	In the Scenario editor's toolbar, click the **Modify existing scenario** button  . Alternatively, just double click the scenario you wish to modify.
3	In the **Modify existing scenario** dialog, assign new inputs and outputs to the scenario, or remove those not needed. Save the changes with **OK**. Save the modified configuration.

7.4 Deleting a Scenario

Step	Action
1	In the Scenario editor, in the list of existing scenarios, select the scenario you wish to delete.
2	In the Scenario editor's toolbar, click the **Delete a scenario** button  .
3	A dialog box opens asking for your confirmation. Note that all input and output links assigned to this scenario will also be deleted. The actual inputs and outputs will of course not be affected.
4	Confirm with **OK** and save the modified configuration.

7.5 Triggering a Scenario

A scenario takes effect when the associated switch or pushbutton is operated. Example: The Shore Leave switch is operated → The **Lamp 1 Corridor** light goes out, the exterior lights are switched ON and the alarm system is activated.

Note:
It is not possible to deactivate a scenario. To reset the outputs set by a scenario action, you have to define and apply a scenario that has the opposite effect. Example: **Shore Leave** scenario versus **Return Aboard** scenario.

8. Programming Procedure

We recommend you follow the setting-up and configuration procedure described below and always adhere to the same order when defining inputs, outputs and their reference to each other. This helps you maintain a systematic approach and prevents you from jumping from one point to the other in the configuration process. The following order has proven the easiest and most efficient.

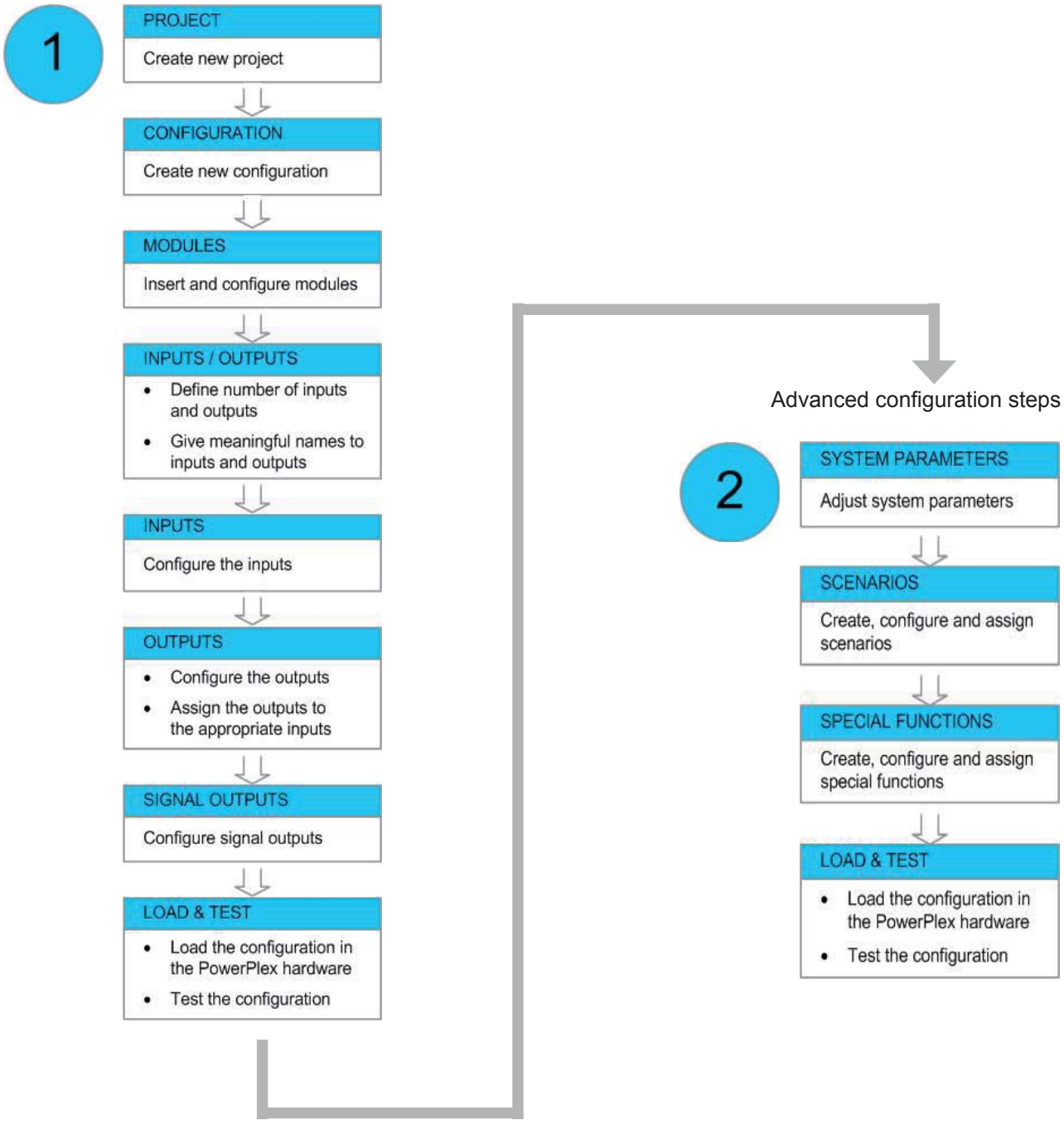


Figure 36: Programming procedure: Flowchart

9. Configuration Example: Minimum Configuration

Let us now step by step go through the process of building our first configuration. We will "program" the minimum configuration shown in Figure 37.

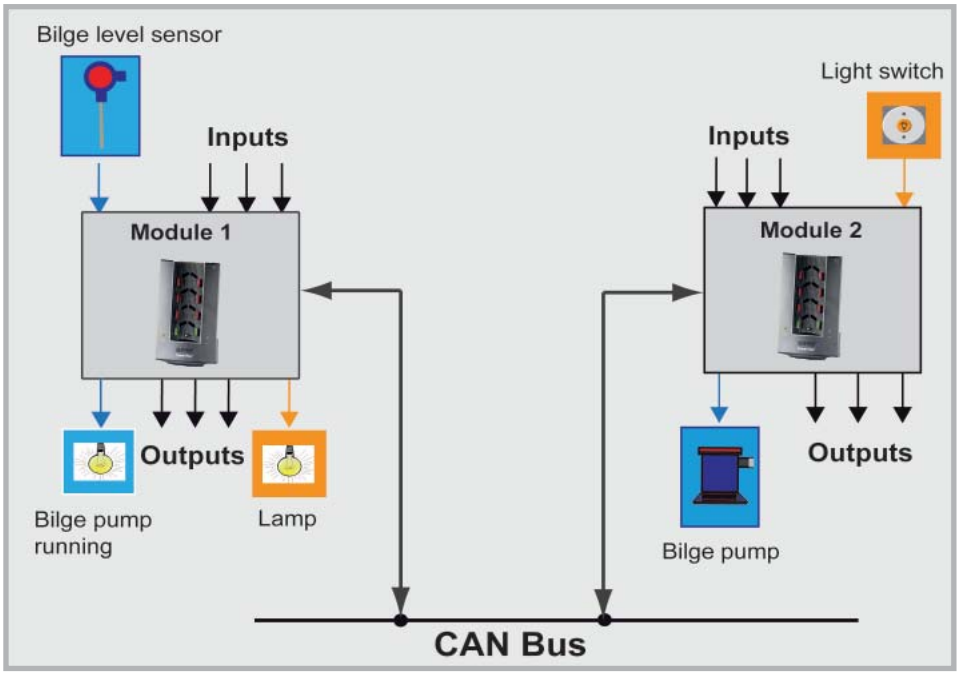


Figure 37: Minimum PowerPlex configuration: Two PowerPlex modules connected by a CAN bus cable

9.1 Description of the Configuration

The loads controlled by the module outputs - here: one lamp and one bilge pump - will typically be installed somewhere on the boat, not necessarily close to the input signal. The distributed control architecture of PowerPlex therefore allows you to monitor and switch appliances anywhere on the boat from any point you wish.

A level sensor monitors the bilge area and feeds the analog quantity "bilge level" to Module 1. From there, the information is transmitted to Module 2 over the CAN bus. As soon as the measured bilge level (i.e., the analog input value) exceeds a predefined limit value, Module 2 sends a switching command to the load, i.e. the "Bilge pump", to switch on the pump and empty the bilge to an acceptable level. Information on the bilge pump status can be sent back to Module 1 to light up the visual "Bilge pump running" indicator.

Module 2 monitors the position of a light switch at one of its digital inputs - ON or OFF - , and sends this status information to Module 1 which switches the light ON or OFF depending on the switch position.

9.2 Characteristics to be "Programmed"

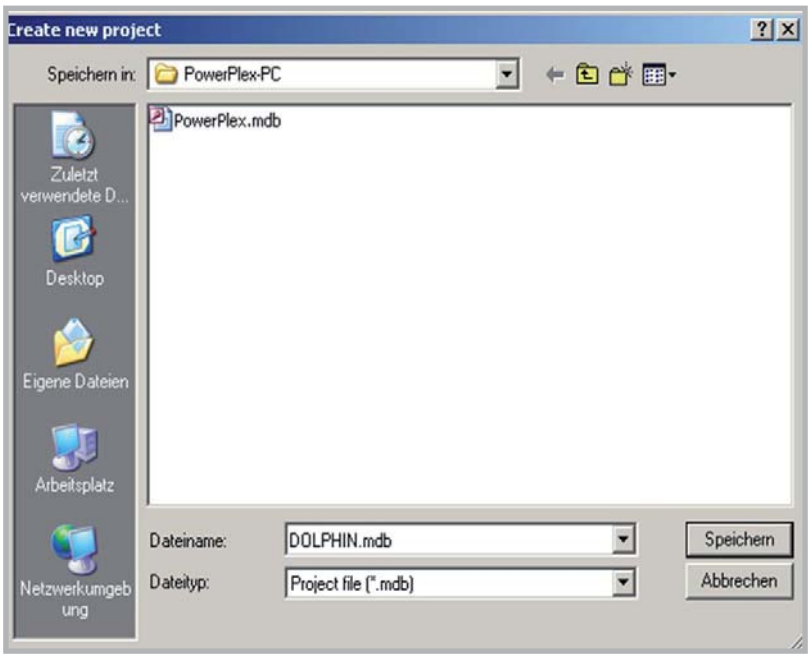
Two DC Power modules with the following characteristics:

	Name	Inputs	Outputs
Module 1	"Bilge area 1"	1 analog input: • level sensor with threshold and switching function • name "Bilge level 1"	1 power output 8 A: • "Lamp 1 Corridor" • 1 signal output: "Bilge pump running"
Module 2	"Bilge area 2"	1 switch input: • "SW Lamp 1 Corridor"	1 power output 25 A: "Bilge pump 1"

9.3 Create a New Project: Project DOLPHIN

Assumption: You have installed the PowerPlex Configuration Software on your computer and opened the program by double clicking the PowerPlex.EXE file.

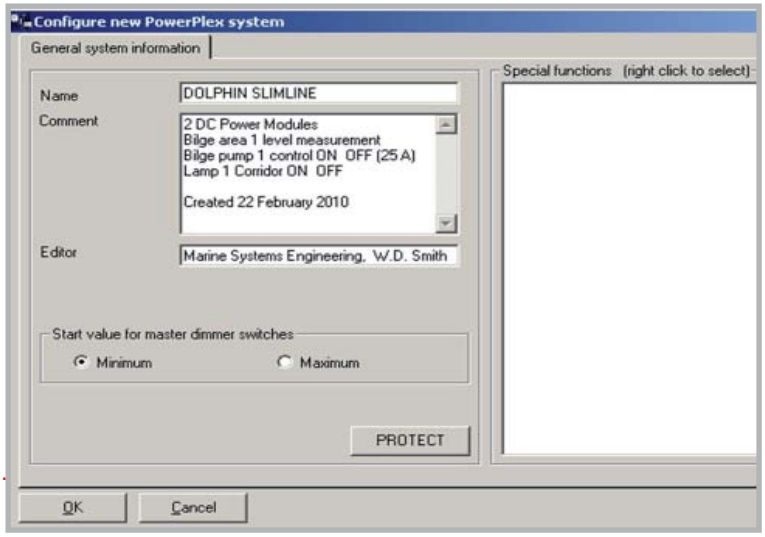
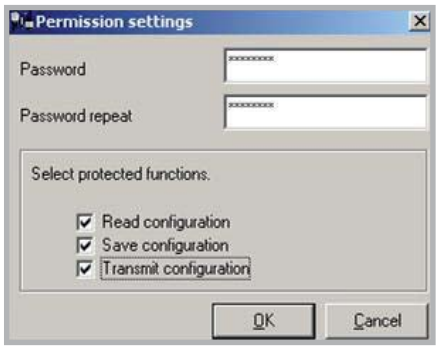
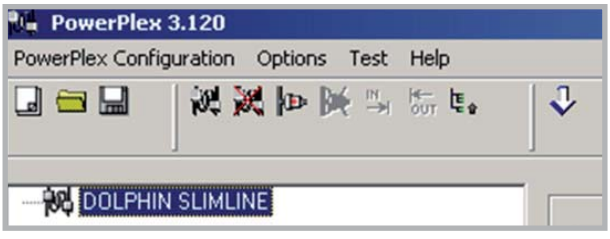
Step	Action
1	In the menu bar, select **Options** → **Create new project**. The **Create new project** dialog box opens.
2	In the **File name** box, overwrite the name of the default project file **PowerPlex.mdb** with the name of your new project. Here: **DOLPHIN.mdb**.



3	**Save** the new project. Confirm the question **Do you want to use the new project file as the current project?** with **Yes**.

9.4 Create a New Configuration: DOLPHIN SLIMLINE

Assumption: You have created a new project, the project DOLPHIN, into which you are going to save the new configuration.

Step	Action
1	In the menu bar, select **PowerPlex Configuration** → **New**. Alternatively, click the shortcut button in the toolbar to create a new configuration: 
2	In the **Configure new PowerPlex System** dialog, enter general system information: Name = DOLPHIN SLIMLINE. In the **Comment** and **Editor** fields you may enter descriptive texts of your choice about the configuration and the person or company that created it. 
3	To specify a password, click the **PROTECT** button. In the **Permission settings** dialog, type in your password and the access rights required. Confirm with OK. 
3	Confirm with **OK**. The **DOLPHIN SLIMLINE** configuration has now been created, but it is still empty, i.e. it contains no hardware modules yet. Therefore it cannot be saved yet using the commands **PowerPlex Configuration** → **Save** or → **Save as...**
4	In the Browser on the left, you will now see the **DOLPHIN SLIMLINE** configuration, albeit without any modules attached to it. 

Configure new PowerPlex configuration → General system information: Parameters

Parameters	Description
Name	Name of the configuration. You are free to type in any name you wish.
Comment	Meaningful comment describing the configuration. You may enter a text of your choice.
Editor	Name of the person who edits the configuration.
Start value for master dimmer switches	A dimmer is designed to switch the assigned output with a short key stroke. A master dimmer dims several dimmer outputs simultaneously. As the individual dimmers assigned to a master dimmer will most probably be at different dimming states, the master dimmer must be given a starting value which can be the maximum or the minimum dimming status. If the staring value is set to Minimum, dimming will move from minimum to maximum. If the starting value is set to Maximum, dimming will move from maximum to minimum.
PROTECT	Opens the **Permission settings** dialog in which password and access rights are defined.

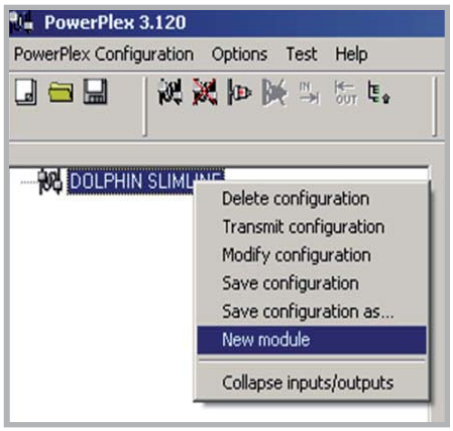
Permission settings: Parameters

Parameters	Description
Password	Password that affects the actions listed and enabled.
Password repeat	Repeated password. Both entries - Password and Password repeat - must match for the password to take effect.
Select protected function	Actions that are protected by the password. Password protected actions are indicated by a check mark. When you initiate a password protected action, such as saving the configuration after having modified it, a dialog will prompt you to enter your password. 

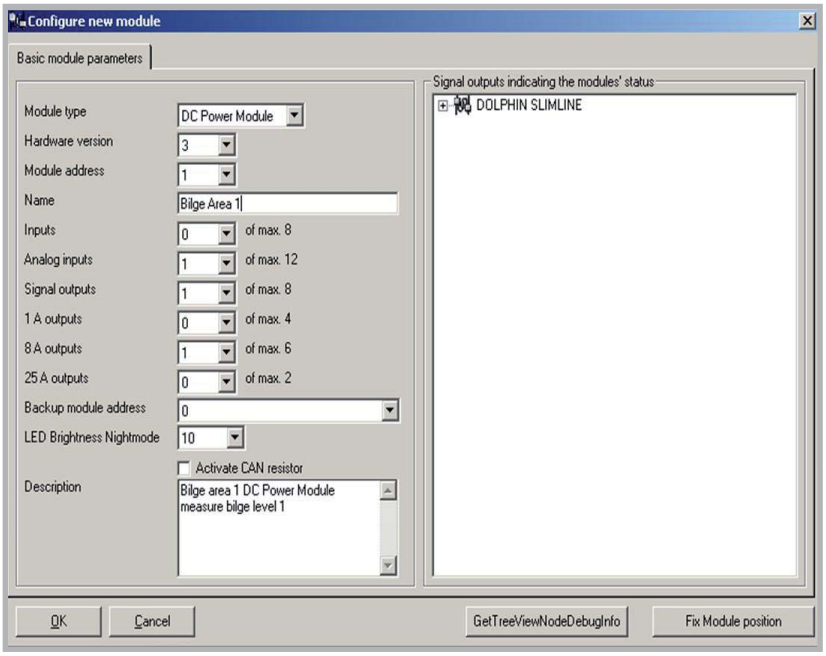
.

9.5 Insert Two PowerPlex Modules in the New Configuration

Step	Action
1	In the toolbar, click the symbol  to insert the first module in the DOLPHIN SLIMLINE configuration. Alternatively, in the Browser, place the cursor on the configuration name and right click to open the context menu. Select the menu item **New module**.



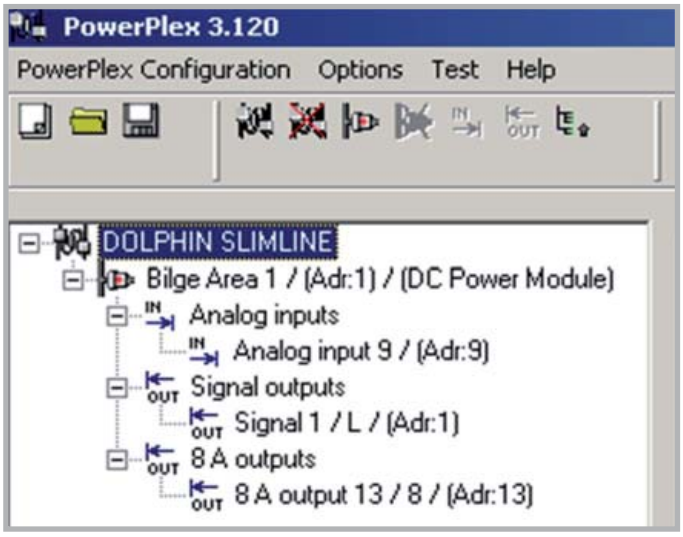
2	The **Configure new module** dialog opens.



In the left section, enter or select the parameters (→ overleaf). For our **DOLPHIN SLIMLINE** example configuration, set the following parameters for module 1:

- DC Power Module "Bilge area 1" with module address 1
- 1 analog input for the bilge level sensor
- 1 power output 8 A for switching the lamp "Lamp 1 corridor"
- 1 signal output to connect a "Bilge pump running" LED

Step	Action
3	Confirm your settings with **OK.** In the browser, you will now see the first module listed.



4 Now, that the first module has been assigned to the configuration, save the configuration for the first time, using the menu command **PowerPlex Configuration** → **Save** or the **Save** toolbar button

The configuration **DOLPHIN SLIMLINE** will now be saved in the project **DOLPHIN** which we had previously defined as the current project database.

Note:

When configuring the module's inputs and outputs, select only the number of I/O actually connected and used. Should you connect additional devices at a later stage, you can always modify the configuration and adjust the number of I/O.

Configure new module Dialog: Parameters

Parameters	Description
Module type	Drop-down menu offering the following module types for selection: DC Power Module, Panel Module, Virtual Module, E-T-A Touch PC
Hardware version	Drop-down menu offering the current version numbers. The most recent version number of the hardware is suggested as default: 3
Module address	Drop-down list offering the bus addresses available in the network: 1 to 30. Addresses already assigned to a module are no longer offered for selection.
Name	Name of the module. Advice: type in a meaningful designation which allows you to identify the purpose and location of the module.
Inputs	Drop-down list offering the max. number of digital switch signal inputs (type SR) allowed for the current module type.
Analog inputs	Drop-down list offering the max. number of analog signal inputs (type Ax) allowed for the current module type.
Signal outputs	Drop-down list offering the max. number of LED signal outputs (type Lx) allowed for the current module type.
1 A, 8 A, 25 A outputs	Drop-down lists offering the max. number of 1 A, 8 A and 25 A power outputs allowed for the current module type.
Backup module address	• Address of another module in the network which shall maintain a backup copy of the module's configuration. • If the current module needs to be removed and replaced, the newly inserted module is automatically configured by an automatic upload of the redundant configuration stored on the backup module. • Only one backup module address is allowed for every module. • When configuring the very first module of a new configuration, no backup module address is available yet as at least 2 modules must be present before you can assign backup addresses. Therefore, after having inserted the 2nd module in a new configuration, adjust the 1st module's parameters and specify a backup module adress for it.
LED Brightness Nightmode	see Special Functions, → Chapter 6.
Activate CAN resistor	Currently not used. Do not enable this checkbox.
Description	Here you may enter a descriptive text explaining module characteristics.
Signal outputs indicating the modules' status	see Special Functions, → Chapter 6.
Fix Module position	see Special Functions, → Chapter 6.

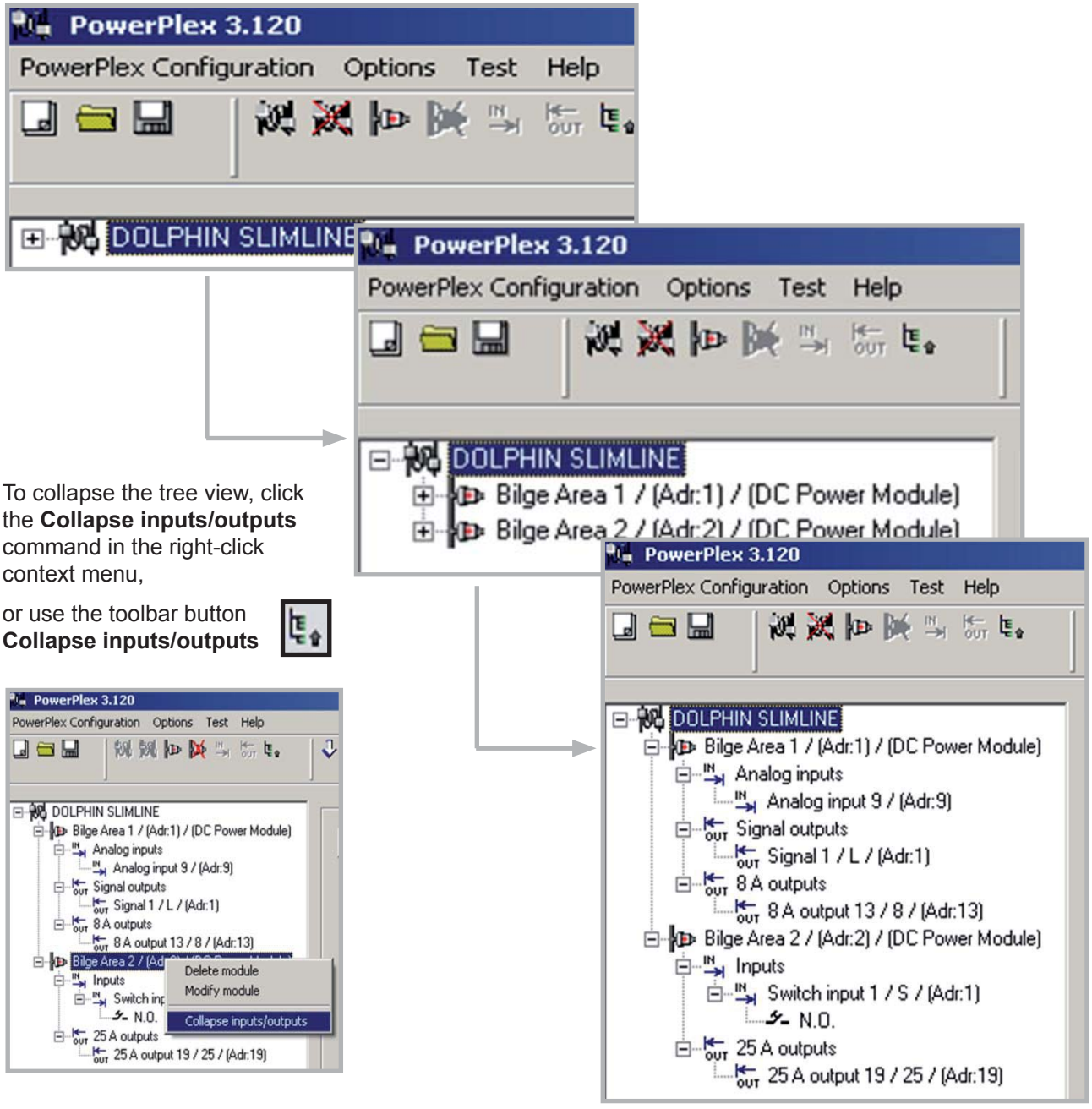
Insert the 2nd Module

In the same way as before, insert the second module under the name "**Bilge Area 2**". The module should have one digital switch input for the light switch signal and one 25 A power output for controlling the bilge pump.

Now, assign **Backup module addresses** to both modules, i.e. one module serves as backup module for the other.

9.6 Expanding and Collapsing the Input / Output View

To view all modules of the configuration, and all inputs/outputs of the modules, just expand the tree view by clicking the "plus" symbols.



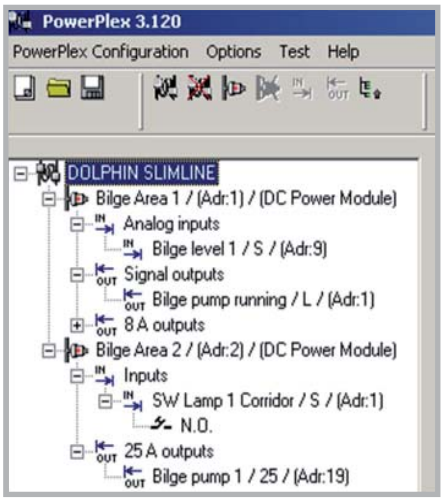
To collapse the tree view, click the **Collapse inputs/outputs** command in the right-click context menu,

or use the toolbar button **Collapse inputs/outputs**

9.7 Assign Meaningful Names to All Inputs and Outputs

Remember, our example configuration shall have the following inputs and outputs:

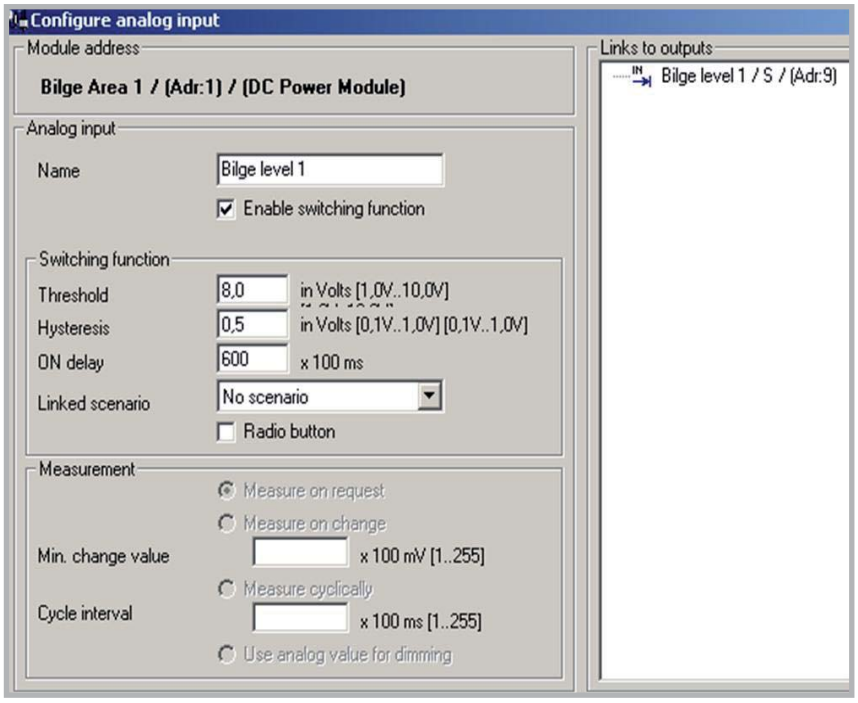
Modules	Inputs	Outputs
Bilge area 1	1 analog input: **Bilge level 1**	1 power output 8 A: **Lamp 1 Corridor** 1 signal output **Bilge pump running**
Bilge area 2	1 switch input: **SW Lamp 1 Corridor**	1 power output 25 A: **Bilge pump** 1

Step	Action
1	In the PowerPlex Browser, with the **DOLPHIN SLIMLINE** configuration loaded, expand the I/O of module **Bilge Area 1**. Double click **Analog input 9 / S / {Adr:9}** to edit it. In the **Configure analog input** dialog, type the name **Bilge level 1** in the **Name** field and confirm with **OK**.
2	Under **Bilge Area 1 → Signal outputs**, double click **Signal 1 / L / {Adr:1**} to edit the signal output. Alternatively, select the output, right click to open the context menu, and select **Modify output**, or click the toolbar button **Configure output**  In the **Configure signal output** dialog, type **Bilge pump running** in the **Name** field. Confirm with **OK.**
3	Next, under **Bilge Area 1 → 8 A output**s, double click **8 A output 13 / 8 / {Adr:13}** to edit it. In the **Configure power output** dialog, type the name **Lamp 1 Corridor** in the **Name** field, and confirm with **OK**.
4	In the Browser, under **Bilge Area 2 → Inputs**, double click **Switch input 1 / S /{Adr:1}.** Alternatively, select the input, right click to open the context menu, and select the command **Modify input**, or click the toolbar button **Configure input**  In the **Configure switch input** dialog, type the name **Switch Lamp 1 Corridor** in the **Name** field and confirm with **OK**.
5	Under **Bilge Area 2 → 25A outputs**, double click **25A output 19 / 25 / {Adr:19}**. In the **Configure power output** dialog, type **Bilge pump 1** in the **Name** field. Confirm with **OK**.
6	The PowerPlex Browser will now display both modules, complete with their newly named inputs and outputs. 

9.8 Configure the Inputs

Our example configuration has two inputs: the analog input of the **Bilge level 1** sensor and the digital switch input **SW Lamp 1 Corridor.** For these inputs we will now define the characteristics.

Step	Action
1	In the Browser, under **Bilge Area 1**, double click the analog input **Bilge level 1** to edit it.
2	In the **Configure analog input** dialog, set the following parameters: • Enable switching function, Threshold = 8 Volts, Hysteresis = 0.5 Volts; • ON delay: 600 (x 100 ms) = 1 minute

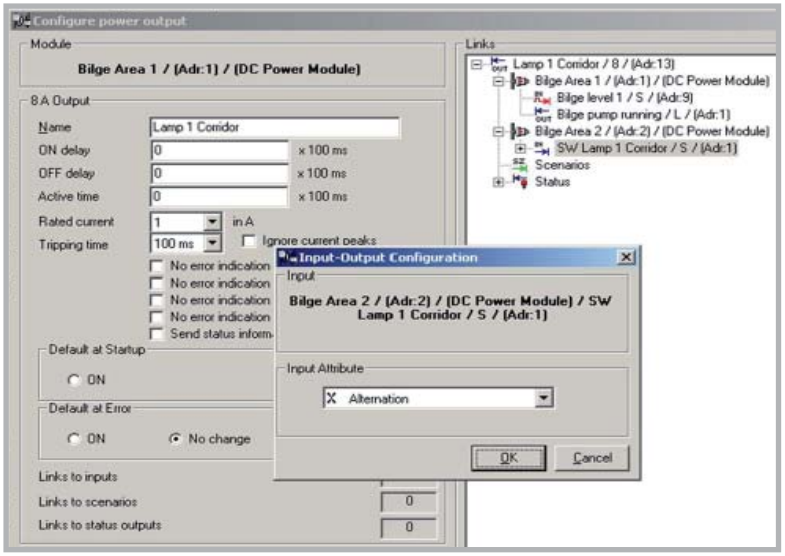


3	In the Browser, under **Bilge Area 2**, double click the digital switch input **SW Lamp 1 Corridor** to edit it.
4	**In the Configure switch input** dialog, set the following parameters: • **Type:** N.O. for normally open contact, i.e. make contact • **Delay time:** 0 Confirm with **OK**. The switch input is now configured. In the **Links to outputs** window on the right, you will now see the new name of the configured input. It is the Switch Input with address 1, hence connected to terminal **S1** of the left-hand terminal block on the DC Power Module.

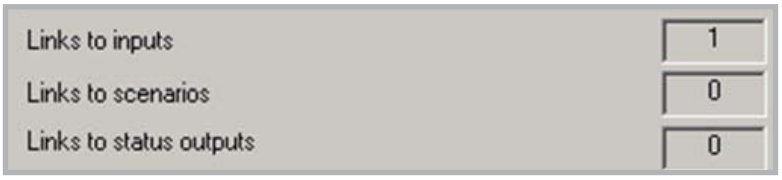
9.9 Configure the Outputs and Assign Them to Inputs / Signal Outputs

Our example configuration has three outputs: the 8 A power output that switches **Lamp 1 Corridor,** the 25 A power output that switches **Bilge pump 1**, and the signal output driving the **Bilge pump running** LED. For these outputs we will now define the characteristics and assign them to the inputs that provide the control command.

Step	Action
1	**Lamp 1 Corridor output:** In the Browser, expand the outputs of module **Bilge Area 1,** expand the 8 A outputs, then double click the **Lamp 1 Corridor** output to edit it.
2	In the **Configure power output** dialog, set the rated current of the lamp control output to **3 A** and the trip time to **100 ms.**
3	Now, assign the power output **Lamp 1 Corridor** of module **Bilge Area 1** to the switch input **SW Lamp 1 Corridor** of module **Bilge Area 2**: In the **Links** window on the right, under **Bilge Area 2**, double left click the **SW Lamp 1 Corridor** input.
4	The **Input-Output Configuration dialog** opens. Select the Input Attribute **Alternation**, i.e. each time the light switch is operated, the lamp changes from ON to OFF, or vice versa. Confirm with **OK**.

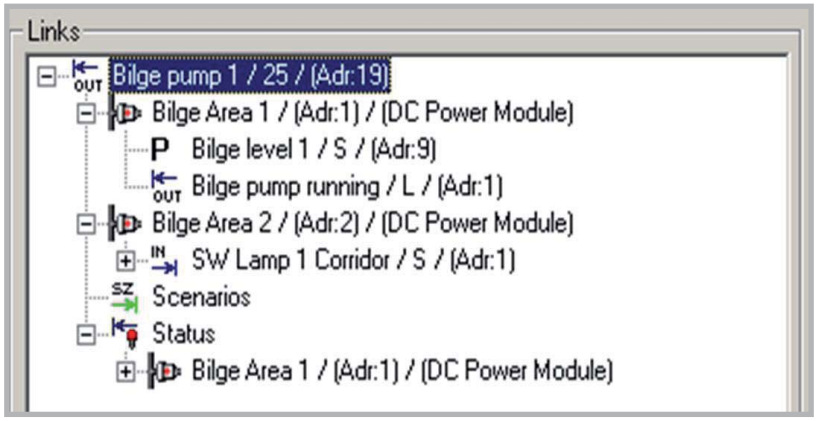


In the bottom left section of the dialog, you should now see one link between the 8A output and an input.

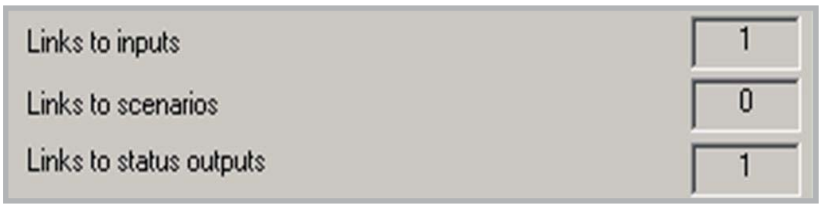


5	Save the configuration in the project.

Step	Action
6	**Bilge pump 1 output:** Next, configure the 25 A power output **Bilge pump 1**. In the Browser, under **Bilge Area 2**, double click the power output **Bilge pump 1**.
7	In the **Configure power output** dialog, enter the following parameters: • ON delay and OFF delay: 30 seconds (300 x 100 ms), each • Rated current: 20 A • Tripping time: 100 ms
8	Now, assign the **Bilge pump 1** output to the analog input **Bilge level 1** of module 1 to which the bilge level sensor is connected. In the **Links** window on the right, double click **Bilge Area 1 → Bilge level 1. In the Input-Output Configuration dialog, select the** Input Attribute **P Parallel N.O.** so that the pump switches on each time the bilge level exceeds the limit, and switches off when the bilge level falls below the limit.
9	Assign power output **Bilge pump 1** to the **Bilge pump running** signal output of module **Bilge Area 1**. Here, the signal output has the task of a status light which is directly assigned to the power output. With an LED connected to the status signal output, this status signal will indicate whether or not the bilge pump is running. In the **Links** window on the right, under **Status → Bilge Area 1,** double click the status signal output **Bilge pump running.** In the **Links** window, the signal output is now highlighted by a small red bulb.



10	In the bottom section of the left window, you should now see: **Links to inputs: 1** and **Links to status outputs: 1**.



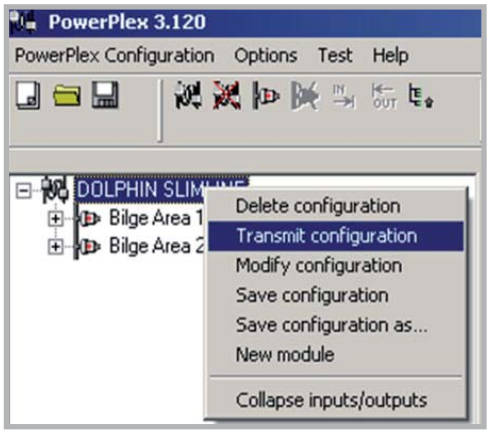
Confirm with **OK** to save your settings.

11	Save your configuration in the project.

9.10 Transmit the Configuration to the PowerPlex Hardware

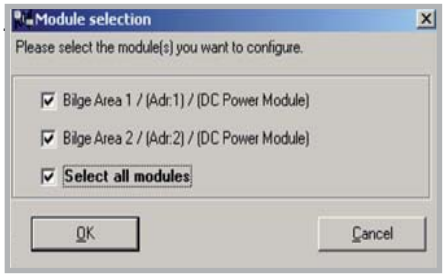
The completed DOLPHIN SLIMLINE can now be loaded into the PowerPlex system to be tested.

Step	Action
1	In the Browser, select the configuration **DOLPHIN SLIMLINE**, right click to open the context menu, and select the menu option **Transmit configuration**.

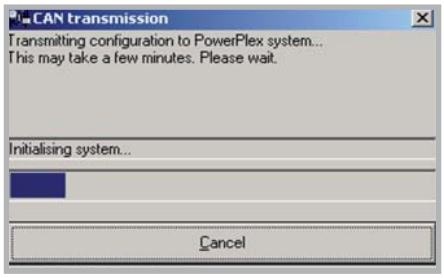


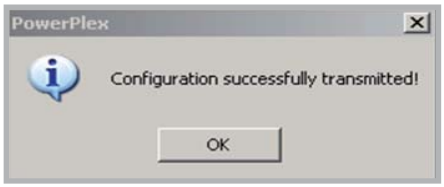
Alternatively you may call the menu command **PowerPlex Configuration → Transmit**, or the toolbar symbol **Transmit** 

2	Next, you will be asked which modules you wish to configure. Check **Select all modules** and confirm with **OK.**



3	The system informs you about the progress of transmission and its success.





4	Now, test your PowerPlex control system using the **Test and Debug** mode.

9.11 Test and Debug

You may test your PowerPlex system using the Test and Debug screen. It allows you to simulate switch inputs and check their effect on the outputs without actually activating switches and connected equipment. In this way, you test the system before using it in a real online situation.

Call the test screen from the menu bar, by selecting **Test → Test and debug mode**.

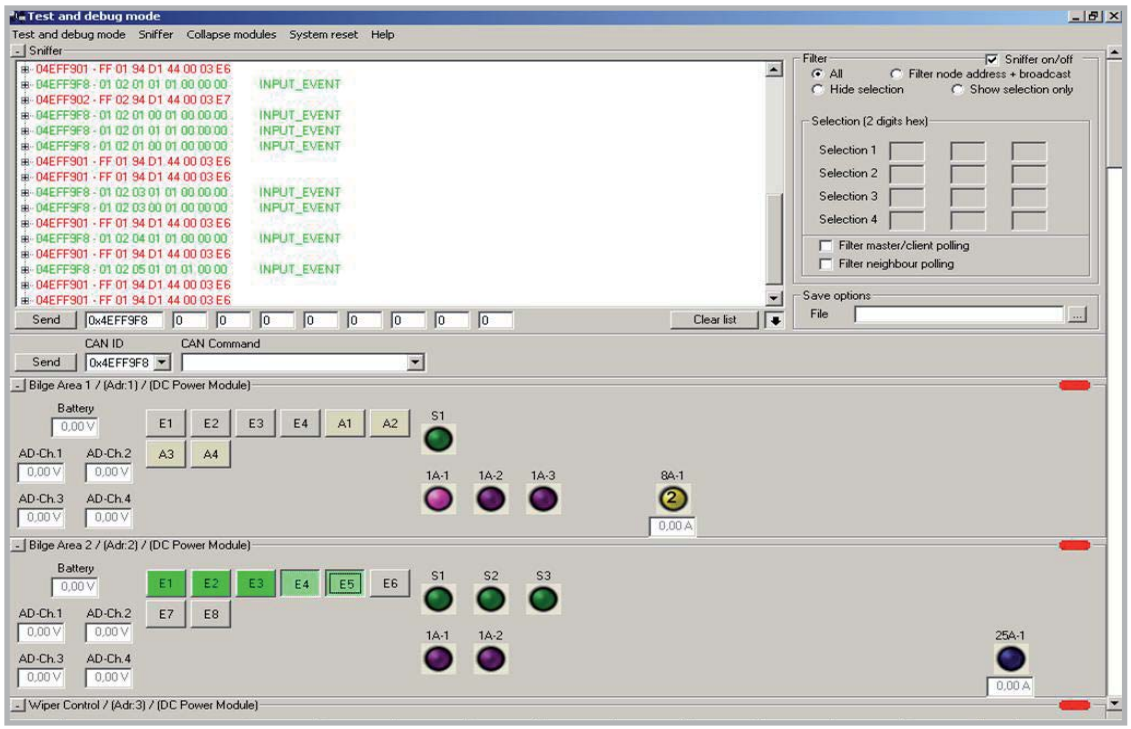


Figure 38: Test and debug window

The test window shows a Sniffer section and a test section for each module of the configuration. Each section can be collapsed and expanded using the + and - buttons in the top left corners.

The Sniffer section shows the data traffic on the CAN bus. Each message line starts with the CAN identifier on the left, and continues with the contents of the data packet in hexadecimal format and a clear text indicating an event. A detailed view of the contents is opened with the + symbol at the beginning of the message line.

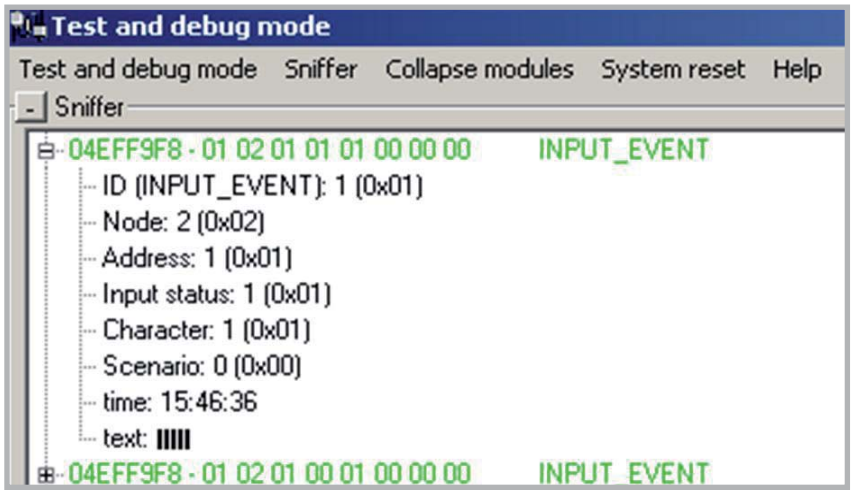


Figure 39: Detailed view of CAN message contents

The sniffer can be switched off in the **Filter** window on the right. Deactivating the sniffer stops the arrival of new CAN packets and allows you to concentrate on the messages received.

The Filter also allows you to filter out certain module addresses, switch on a logging function and specify a log file in which the received data packets can be saved for further analysis.

In the lower section of the Test and debug window, you see a test section for every module of the configuration. The module's inputs and outputs are displayed. Switch inputs can be operated by a mouse click. Analog inputs configured as digital switch inputs are represented by the buttons A1 to A4. These, too, can be operated by a mouse click.

In the Test and debug menu, you may activate two modes:

- the display of current and voltage levels
- the expert mode

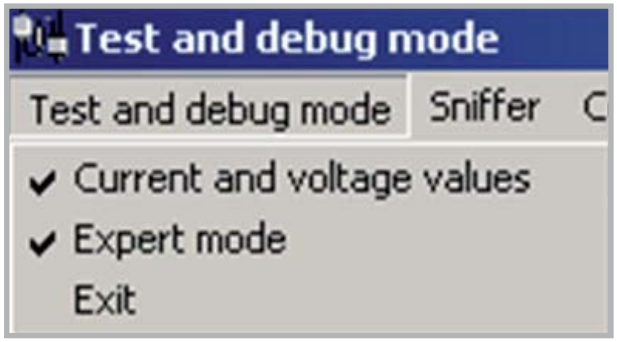


Figure 40: Test and debug menu

Current and voltages levels measured by analog inputs are scanned and displayed at 4 second intervals. The analog values are shown by means of the AD Ch. 1 to AD-Ch. 4 symbols.

The expert mode allows you to activate and deactivate power outputs that are not configured yet in order to see their effect. Just click the associated coloured dot-symbol in the **Test and debug** dialog, such as

10. Windscreen Wiper Motor

10.1 Introduction

Boat builders benefit from a vast range of wiper motors designed for the automotive industry. The similarities between the windscreens of marine vessels and automobiles made the development of special marine wiper motors practically unnecessary.

A wiper motor typically has two windings to allow two different rotational speeds. These windings must usually be controlled individually, i.e. by means of one control relay for each of the rotational speeds.

PowerPlex, however, offers a special windscreen wiper configuration which controls the two different wiper speeds by means of one control sequence.

Thus, the E-T-A PowerPlex system greatly facilitates the installation of windscreen wipers in marine vessels. The use of separate relays is a thing of the past as the motor can be connected directly to the PowerPlex system.

10.2 Typical Windscreen Wiper Motor Principle

Typical windcsreen wiper motors employed in marine applications are combined units comprising the wiper motor, the step-down gear and the wiper rod linkage. They are connected by means of 5 electric terminals:

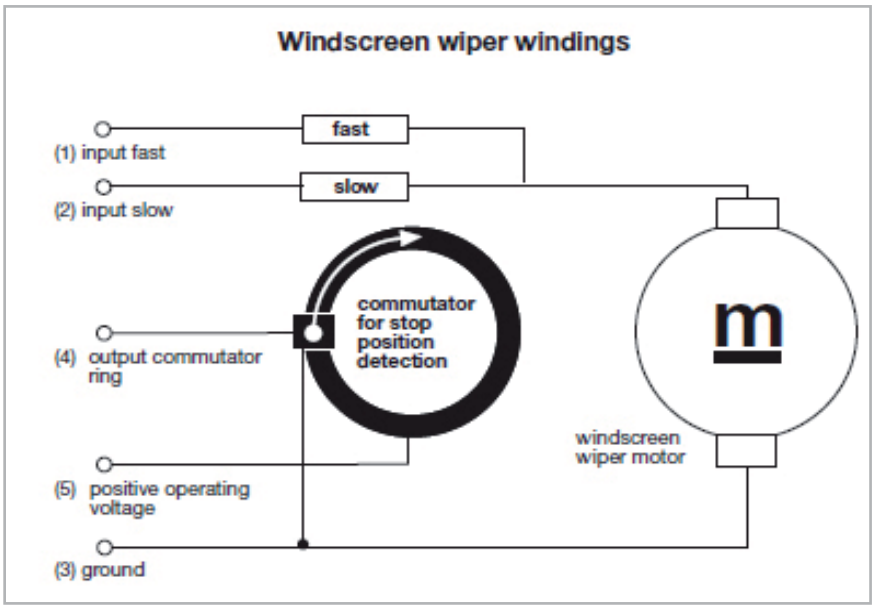


Figure 41: Windscreen wiper motor principle: Terminals

10.3 Connecting the Wiper Motor to the DC Power Module

You may connect up to three windscreen wiper motors to one DC Power Module. Connect the motor's fast and slow speed winding terminals to the 8 A power outputs of the DC module (→ Figure 41).

10.3.1 Connecting the Winding Terminals

Connect the slow speed winding terminals (2) to the 1st, 3rd and 5th power outputs, and the fast speed terminals (1) to the 2nd, 4th and 6th power outputs of the DC Power Module. Connect the ground potential terminal (3) to one of the two return conductors.

DC Power Module 8 A Power Output	Wiper Motor No.	Terminal Speed
1st	1	Slow
2nd	1	Fast
3rd	2	Slow
4th	2	Fast
5th	3	Slow
6th	3	Fast

Table 7: Connecting the wiper motor winding to the 8 A power outputs of the DC Power Module

10.3.2 Detecting the Wiper's Stop Position

For detection of the stop position, the windscreen wiper motor is fitted with a commutator which is integrated in the step-down gear. Only in the stop position will the commutator (4) be connected to ground. In all other cases the commutator (4) is connected to the operating voltage (5).

Although practically the windscreen wiper is now operable, automatic return of the wiper blade to the resting position when the wiper motor is turned off is not yet implemented.

The analog inputs of the DC Power Module can be used for determining the wiper resting position. Connect the wiper motor's commutator terminal (4) to the analog input. If configured to function as switch input, the analog input will continue to supply power to the wiper motor after manual switch-off until the wiper blade has reached its resting position.

Note:

If the commutator (4) and voltage (5) terminals are inadvertantly swapped, a short circuit occurs at the commutator ring when the motor rotates through the resting position. This will destroy the commutator ring, and automatic disconnection in the resting position will no longer be possible.

Wiper motor	Connecting the commutator ring to determine the wiper resting position	
No. 1	1A power output Analog input	Wiper Positive operating voltage (5) Wiper Commutator ring output (4)
No. 2	1A power output Analog input	Wiper Positive operating voltage (5) Wiper Commutator ring output (4)
No. 3	1A power output Analog input	Wiper Positive operating voltage (5) Wiper Commutator ring output (4)

Table 8: Connecting the commutator ring to determine the wiper resting position

Note:

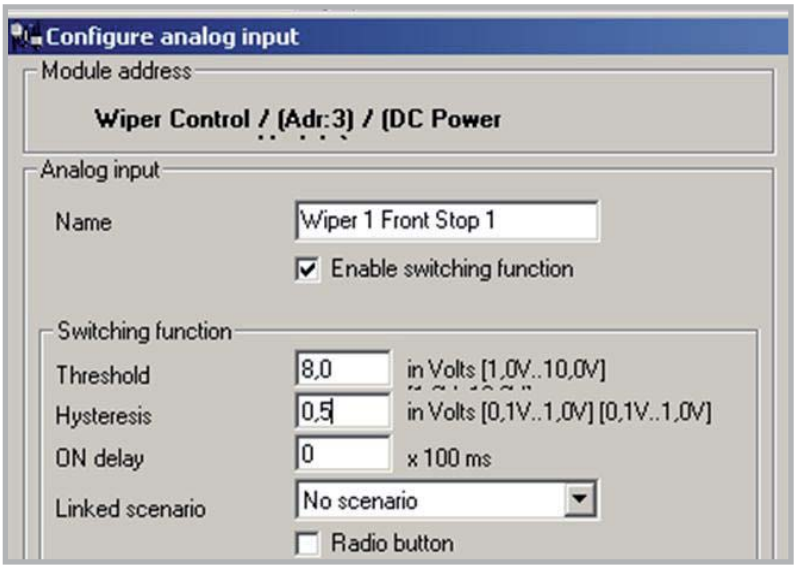
After the windscreen wiper motor is turned off the wiper blade continues to sweep at slow speed until it finally reaches the resting position. This enures that the wiper blade always comes to rest at exactly the same position.

When you have finished connecting the windscreen wiper motor(s) to the DC Power Module, start the PowerPlex Configuration Software to define the necessary windscreen wiper motor inputs and outputs.

10.4 Wiper Motor: Analog Input

Define an analog input to determine the resting position of the wiper blade by means of the motor's integrated commutator ring. Incidentally, if your PowerPlex system controls several wiper motors, it may be a good idea to define and dedicate one DC Power Module just for wiper motor control.

Step	Action
1	In the browser, select the DC Power Module and define a new anlog input
2	In the **Configure analog input** dialog box, set the parameters of the new analog input:



- Enable switching function
- Threshold: 8.0 V
- Hysteresis: 0.5 V

3	Confirm your settings and save the configuration.

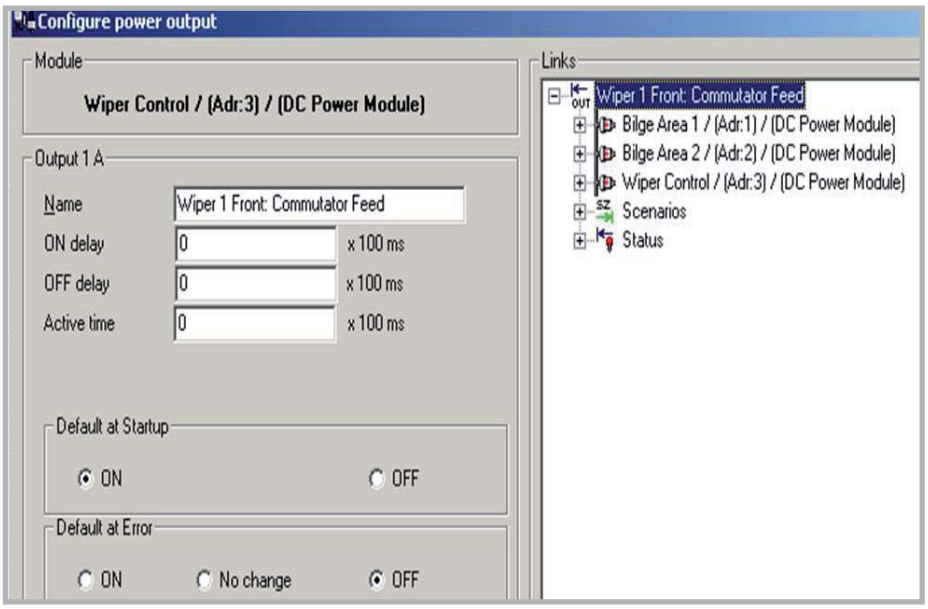
The analog input monitors the wiper speed for its stop position:

- Commutator voltage = 8V → Wipers are still moving; wipers will continue at slow speed
- Commutator voltage = 0V → Wipers have stopped)

Note:
When the wipers are switched off, they will automatically first change to the slow speed before they then reach the end of travel position. This is an automatic function integrated in the PowerPlex software; there is no need to configure this feature.

10.5 Wiper Motor: 1 A Power Output

Step	Action
1	In the browser, select the DC Power Module and define a new 1 A power output
2	In the **Configure power output** dialog box, set the parameters of the new analog input:



3	Confirm your settings with **OK** and save the configuration.

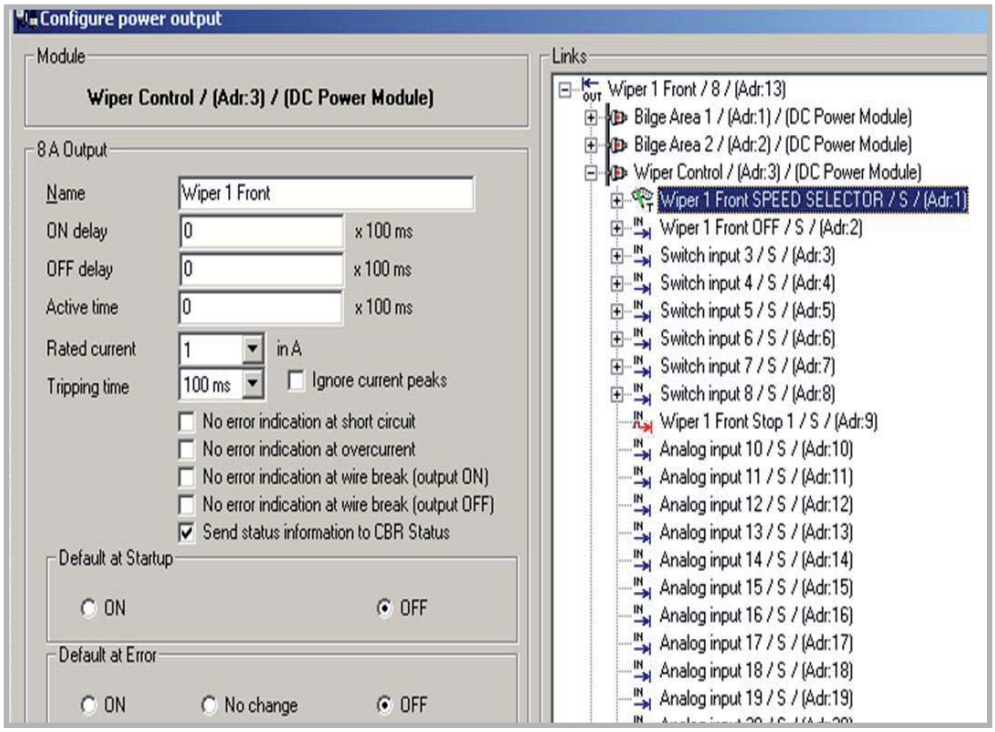
No specific requirements have to be observed for the supply of the wiper motor's commutator ring. Due to the high input resistance of a PowerPlex analog input, there will be no undue load on the 1A power output.

Simply make sure that the power output is permanently active after system start.

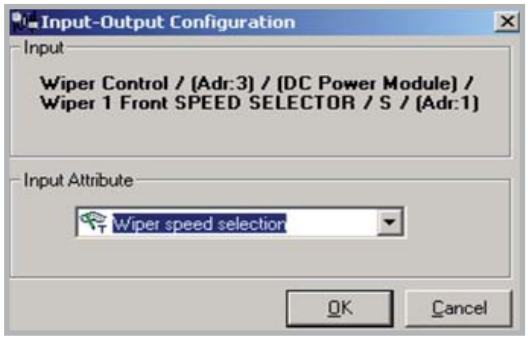
10.6 Wiper Motor: 8 A Power Outputs

For each wiper motor you wish to connect, define two 8 A power outputs, one for the slow and one for the fast wiper speed.

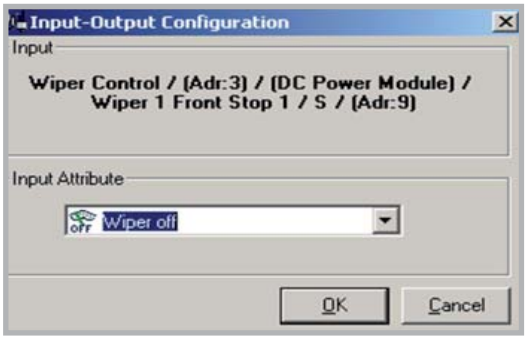
Step	Action
1	In the browser, define or select two new 8 A power outputs for each wiper motor.
2	In the **Configure power output** dialog box, set the parameters of the new analog input:



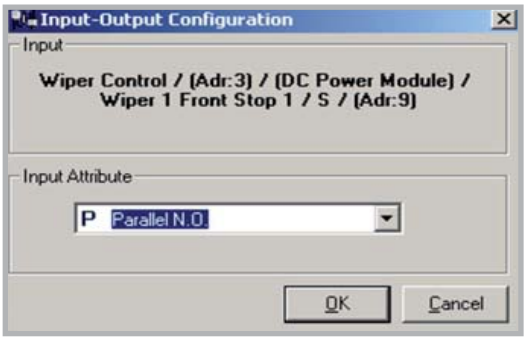
3	Set the parameters as follows: • 3 A rated current (ref. motor data sheet for rated current under load operation) • 100 ms delay prior to overcurrent protection trip • Ignore current peak (inrush current at power up) • Enable wire break indication for ON and OFF status • Send status information to CBR Status (→ 6.4). • Default at Startup: OFF and Default at Error: OFF
4	In the **Links** window on the right, assign the 8 A power output to two momentary switch inputs. The first one activates the wiper and starts it at slow speed. When operated, it toggles the speed between slow and fast. Assign the input and set the Input Attributes to **Wiper speed selectio**n. Confirm with **OK**.



Step	Action
5	The second momentary switch stops the windscreen wiper. When operated, the wiper blade will first assume the slow speed and then stop in the end of travel position. Assign the second switch input and set its Input Attributes to Wiper OFF. Confirm with **OK**.



6	Now, still in the **Links** window on the right, assign the analog input defined earlier on as switch input (→ 10.4) to the input. The analog input monitors the wiper speed for its stop position (commutator voltage = 8V: wiper still moving, commutator voltage = 0V: wiper has stopped). Confirm with **OK**.



.

7	Assign a status LED to the 8 A output.
8	Save the configuration.

10.7 Quick Guide to Windscreen Wiper Motor Configuration

Step	Action
1	Dedicate one or several DC Power Modules to the windscreen wiper control, depending on the number of windscreen wiper motors you want to connect to your PowerPlex system. Remember: you can connect up to three wiper motors to one DC Power Module). Make sure the DC Power Module is located in the vicinity of the wiper motor and has sufficient free inputs and outputs. One wiper motor requires the following I/O: • two 8 A power outputs, • one 1 A power output, • two switch inputs, one for ON and Slow/Fast selection, one for OFF • one analog input, for zero speed monitoring • two status outputs if the power outputs shall be monitored). **Note:** The two 8 A power outputs and the analog input must be on the same DC Power Module.
2	On the DC Power Module, allocate the required terminals according to Table 7. Using a side cutter, cut through the electric bridges of the power outputs for the slow speed windings (→ Figure 42).
3	Connect the wiper motor windings to the DC Power Module (→ Table 7).
4	Connect the commutator ring for determining the wiper resting position (→ Table 8).
5	Connect the wiper motor pushbutton (e.g., E-T-A 3131 three-position pushbutton switch, one for each wiper motor) to two inputs on any module of your PowerPlex system.
6	If required, connect two Status LEDs for monitoring the wiper motor status.
7	Enter meaningful designations to all inputs and outputs in the dialogs of the PowerPlex Configuration Software.
8	Configure the required analog inputs (→ section 10.4).
9	Configure the required 1 A power outputs (→ section 10.5).
10	Configure the required 8 A power outputs (→ section 10.6). • Define the power output's Rated current and Tripping time. • Link the switch output to analog inputs and, if applicable, to status LEDs. • Allocate the output to the CBR status.

Note:
Make sure the wiper motor is correctly and securely installed before turning it on. Never touch any part of the rod linkage while the motor is running as this could cause serious injury.

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