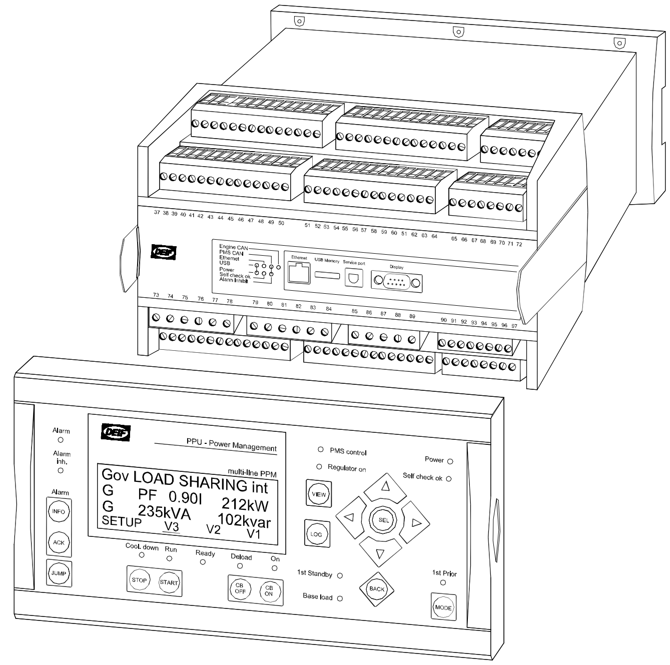
# Description of options

# Option N,
# PPU Power Management (PPM)

***4189340411C***



- *Software option*
    - *Option N5: TCP/IP Modbus communication*
- *Settings*

DEIF A/S

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*E-mail: deif@deif.com, URL: www.deif.com*

Table of contents

# 1. Warnings and legal information

This chapter includes important information about general legal issues relevant in the handling of DEIF products. Furthermore, some overall safety precautions will be introduced and recommended. Finally, the highlighted notes, which will be used throughout this document, are presented.

## Legal information and responsibility

DEIF takes no responsibility for installation or operation of the generator set. If there is any doubt about how to install or operate the engine/generator controlled by the multi-line 2 unit, the company responsible for the installation or the operation of the set must be contacted.

**The multi-line unit is not to be opened by unauthorised personnel. If opened anyway, the warranty will be lost.**

## Electrostatic discharge awareness

Sufficient care must be taken to protect the terminals against static discharges during the installation. Once the unit is installed and connected, these precautions are no longer necessary.

## Safety issues

Installing the multi-line 2 unit may imply work with dangerous currents and voltages. Therefore, the installation should only be carried out by authorised personnel who understand the risks involved in working with live electrical equipment.

## Programming

The multi-line 2 unit is delivered from factory with factory settings. These are based on an average value and do not necessarily represent values matching the engine/generator set in question. Precautions must be taken to check this before running the engine/generator set.

## Notes

Throughout this document a number of notes will be presented. To ensure that these are noticed, they will be highlighted in order to separate them from the general text.

**The notes provide general information which will be helpful for the reader to bear in mind.**

# 2. Hardware

The N options need the Ethernet port in the front of the multi-line 2 unit(s). As this connection uses a standard TCP/IP network media, no additional technical explanation is necessary in this chapter.

**We recommend using CAT5 TCP/IP cable only in order to avoid any cable quality trouble.**

## System requirements

- IBM PC 486DX4-100MHz CPU or higher, or compatible system
- TCP/IP port available
- Supports Windows se/me/2000/xp

# 3. Configuration of the PC and the option N processor card

The Ethernet port of the multi-line 2 option N processor card has to be configured with an IP address, subnet mask, gateway and DNS server, fitting the network to which it will be connected. The factory IP address is 192.168.2.21 and the factory subnet mask is 255.255.255.0.

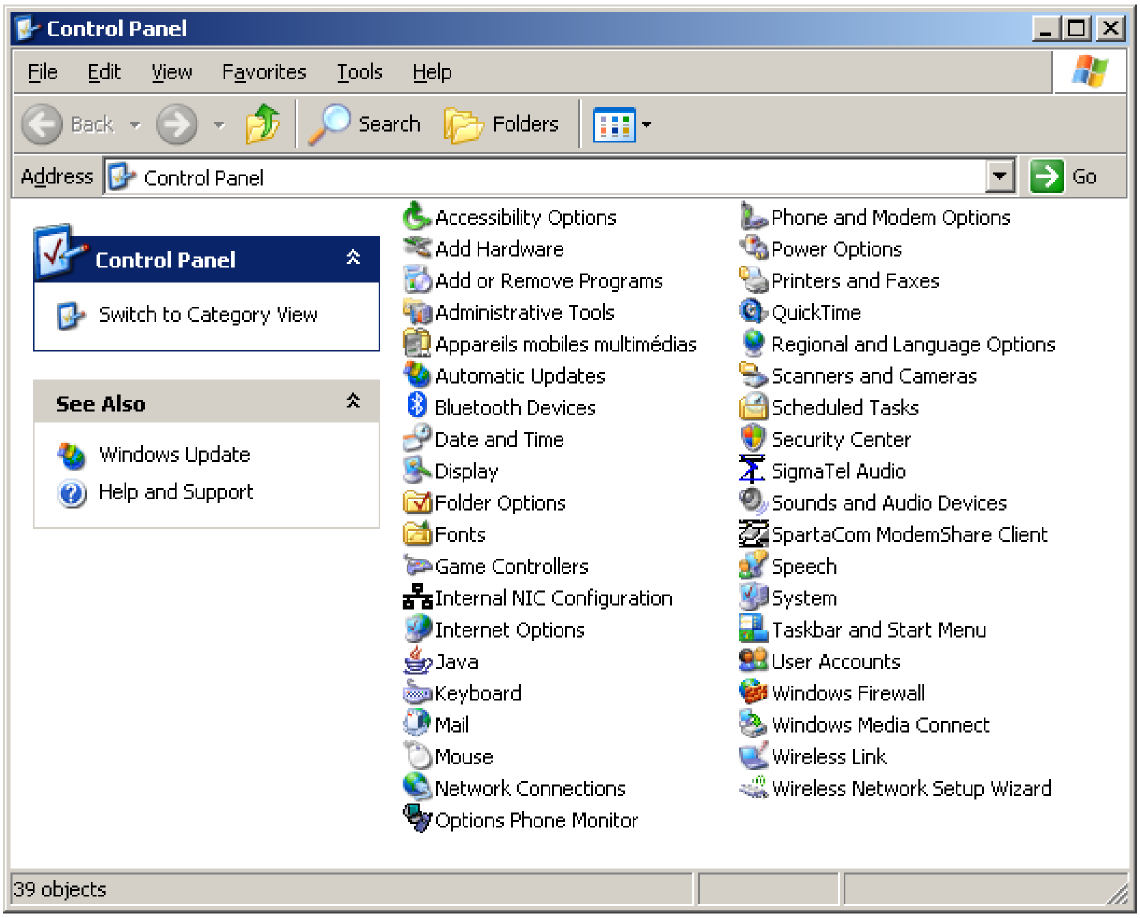
To change the IP address, a PC with a network card installed is needed. To make the PC communicate with the multi-line 2 unit, the network settings of the PC have to be modified and disconnected from any other TCP/IP network. The PC and the multi-line 2 option N processor card can now be connected by means of the crossed Ethernet cable (red TCP/IP cable provided by DEIF, or any other crossed TCP/IP CAT5 cable).

The IP address of the PC must be changed to match the IP address of the multi-line 2 option N processor card.

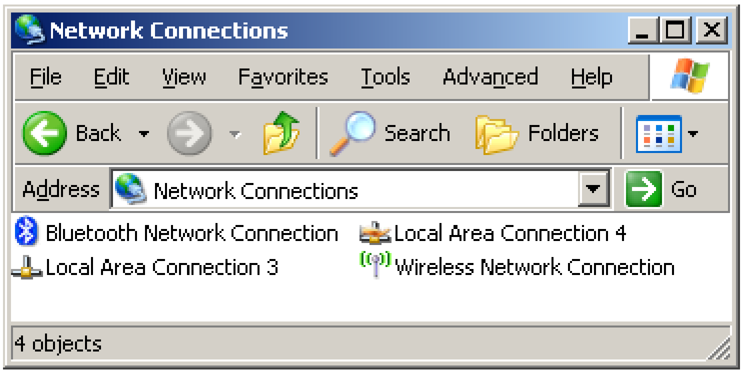
## Configuration of the PC that will set up the option N processor card setup

The screen dumps below are based on a Windows XP system, but it is quite similar when using other Windows systems.

Click ‘Start’ (lower left corner of the PC screen) and select ‘Control Panel’.



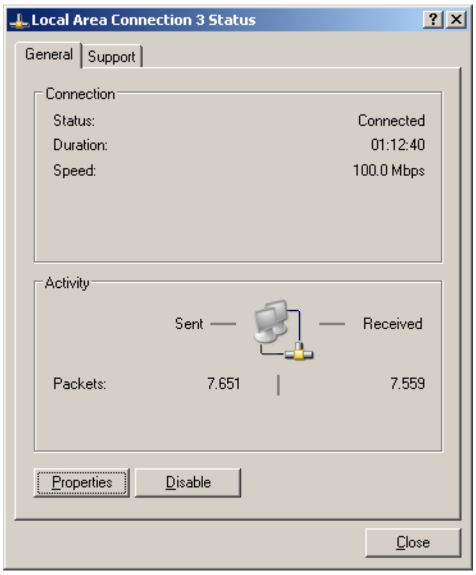
Double-click ‘Network Connections’.


Network Connections
File Edit View Favorites Tools Advanced Help
Back Search Folders
Address Network Connections Go

Bluetooth Network Connection
Local Area Connection 4
Local Area Connection 3
Wireless Network Connection

4 objects

Double-click ‘Local Area Connection 3’
(is used for connection to your usual network).



Connection

Status: Connected

Duration: 01:12:40

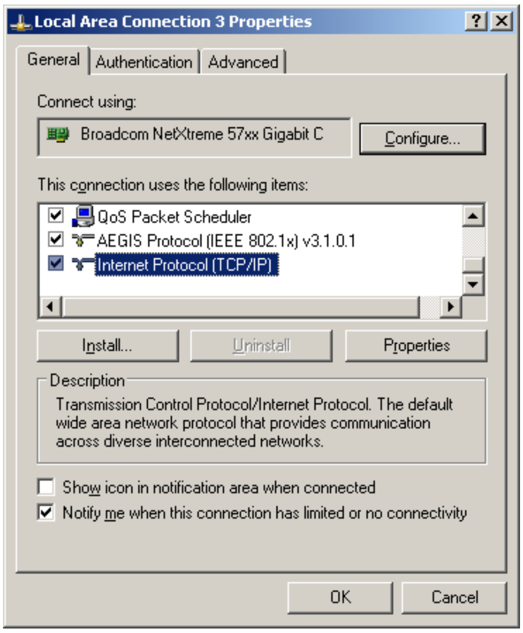
Speed: 100.0 Mbps

Activity

Sent — Received

Packets: 7.651 | 7.559

Click ‘Properties’.


Local Area Connection 3 Properties
General Authentication Advanced
Configure...
Install... Uninstall Properties
OK Cancel

Connect using:

Broadcom NetXtreme 57xx Gigabit C

This connection uses the following items:

☑ QoS Packet Scheduler
☑ AEGIS Protocol (IEEE 802.1x) v3.1.0.1
☑ Internet Protocol (TCP/IP)

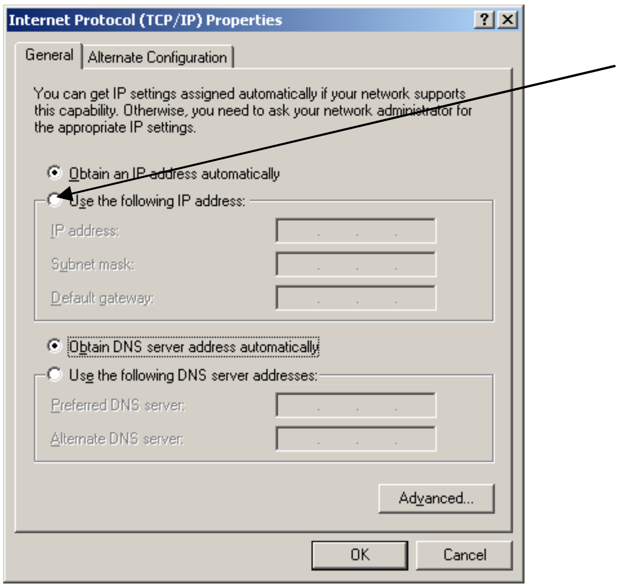
Description

Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.

☐ Show icon in notification area when connected
☑ Notify me when this connection has limited or no connectivity

Select the last line ‘Internet Protocol (TCP/IP)’ and then click the ‘Properties’ button.

Mostly, it looks like this:



**Internet Protocol (TCP/IP) Properties**

General | Alternate Configuration

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

● Obtain an IP address automatically
○ Use the following IP address:

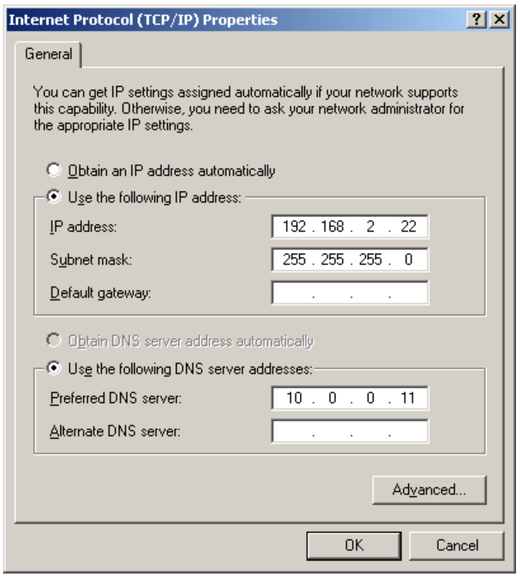
IP address: . . .
Subnet mask: . . .
Default gateway: . . .

● Obtain DNS server address automatically
○ Use the following DNS server addresses:

Preferred DNS server: . . .
Alternate DNS server: . . .

Select this.

Write IP address = 192.168.2.22 (option N processor card IP address + 1), and Subnet mask = 255.255.255.0. Do not write any default gateway address. As regards the DNS server, it is not necessary to write anything, but if you know the DNS IP address, you can write it there (e.g.: 10.0.0.11).



**Internet Protocol (TCP/IP) Properties**

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

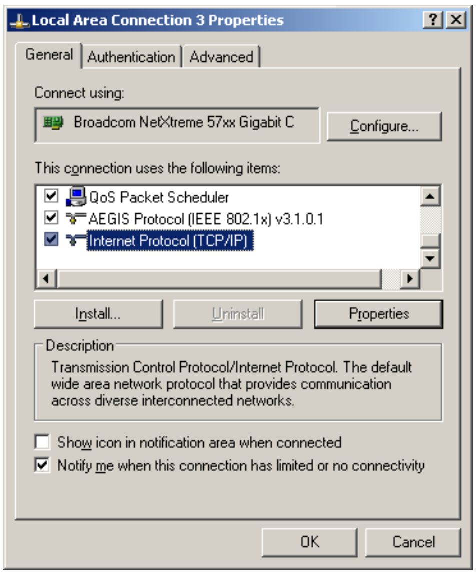
○ Obtain an IP address automatically
● Use the following IP address:

IP address: 192 . 168 . 2 . 22
Subnet mask: 255 . 255 . 255 . 0
Default gateway: . . .

○ Obtain DNS server address automatically
● Use the following DNS server addresses:

Preferred DNS server: 10 . 0 . 0 . 11
Alternate DNS server: . . .

Click ‘OK’.



**Local Area Connection 3 Properties**

General | Authentication | Advanced

Connect using:

Broadcom NetXtreme 57xx Gigabit C

This connection uses the following items:

☑ QoS Packet Scheduler
☑ AEGIS Protocol (IEEE 802.1x) v3.1.0.1
☑ Internet Protocol (TCP/IP)

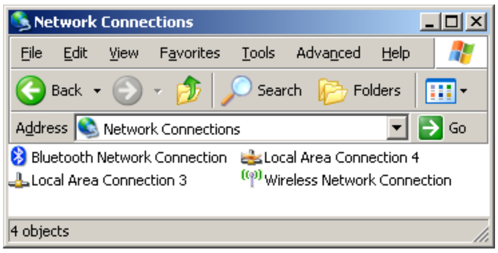
Description

Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.

□ Show icon in notification area when connected
☑ Notify me when this connection has limited or no connectivity

Click ‘OK’.

You can now close the ‘Network Connections’ window.



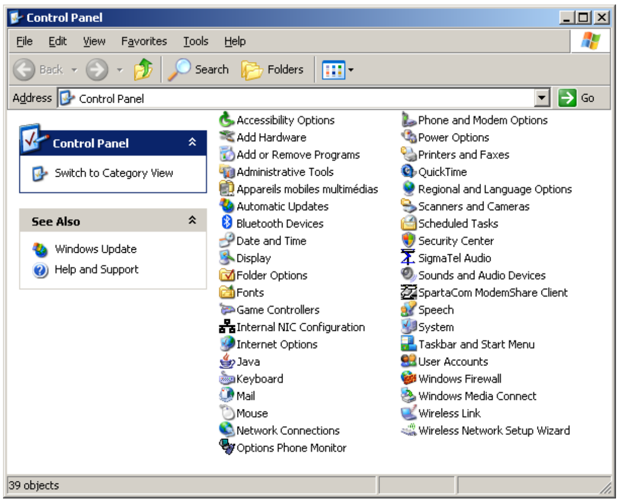
**Network Connections**

Address: Network Connections

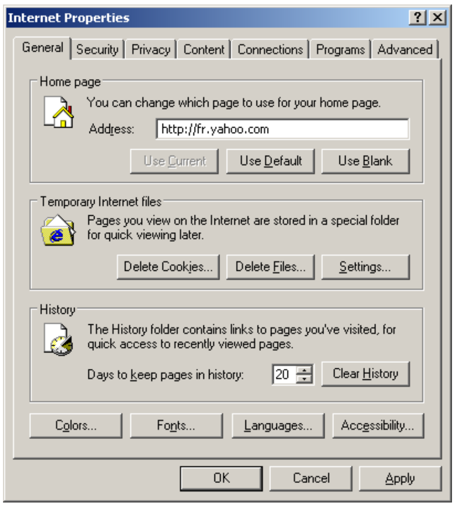
Bluetooth Network Connection
Local Area Connection 4
Local Area Connection 3
Wireless Network Connection

4 objects

Click ‘Start’ (lower left corner of the PC screen) and select ‘Control Panel’.



Double-click 'Internet Options'.


Internet Properties
General Security Privacy Content Connections Programs Advanced
Home page
Use Current Use Default Use Blank
Temporary Internet files
Delete Cookies... Delete Files... Settings...
History
Clear History
Colors... Fonts... Languages... Accessibility...
OK Cancel Apply

You can change which page to use for your home page.

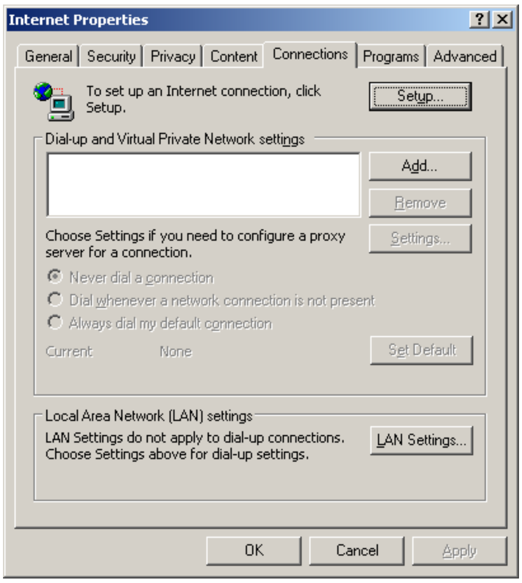
Address: http://fr.yahoo.com

Pages you view on the Internet are stored in a special folder for quick viewing later.

The History folder contains links to pages you've visited, for quick access to recently viewed pages.

Days to keep pages in history: 20

Select the ‘Connections’ tab.


Internet Properties
General Security Privacy Content Connections Programs Advanced
Setup...
Dial-up and Virtual Private Network settings
Add...
Remove
Settings...
Set Default
Local Area Network (LAN) settings
LAN Settings...
OK Cancel Apply

To set up an Internet connection, click Setup.

Choose Settings if you need to configure a proxy server for a connection.

● Never dial a connection

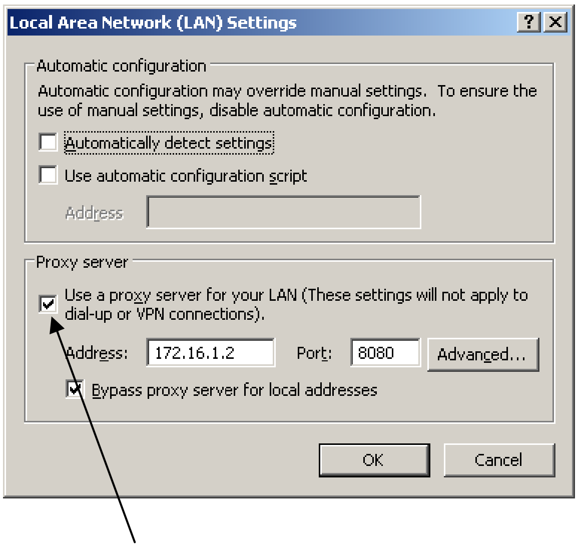
○ Dial whenever a network connection is not present

○ Always dial my default connection

Current None

LAN Settings do not apply to dial-up connections. Choose Settings above for dial-up settings.

Click ‘LAN Settings…’.



Automatic configuration may override manual settings. To ensure the use of manual settings, disable automatic configuration.

□ Automatically detect settings

□ Use automatic configuration script

Address

☑ Use a proxy server for your LAN (These settings will not apply to dial-up or VPN connections).

Address: 172.16.1.2 Port: 8080

☑ Bypass proxy server for local addresses

Deselect this and click ‘OK’.

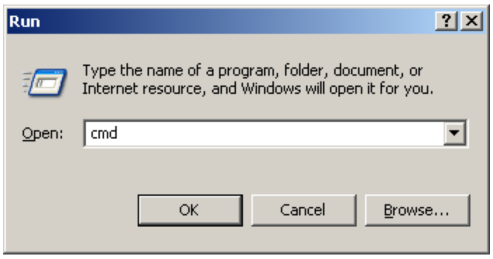
Close the 'Internet Options' window and close the 'Control Panel' window.

Connect the crossed TCP/IP red cable between your PC and the Ethernet socket of the multi-line 2 unit option N processor card. Your PC is now ready to dialog with the option N card and has full access to it.

## Option N processor card setup

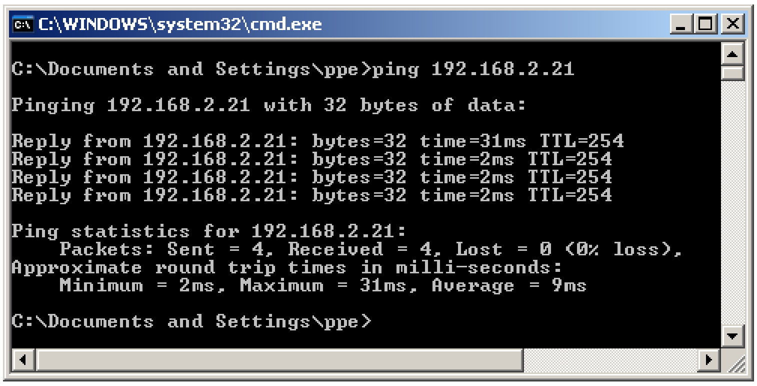
When your PC has been set up as described on the previous pages, and the PC is directly connected to the Ethernet socket of the multi-line 2 unit option N processor card, you must now check if you have access to the option N processor card from the internet connection by means of the ping utility program from your PC.

Click 'Start' (lower left corner of the PC screen) and select 'Run…'. Type 'cmd' and press the 'Enter' or 'OK' key.


Run
?
Type the name of a program, folder, document, or Internet resource, and Windows will open it for you.
OK
Cancel
Browse...

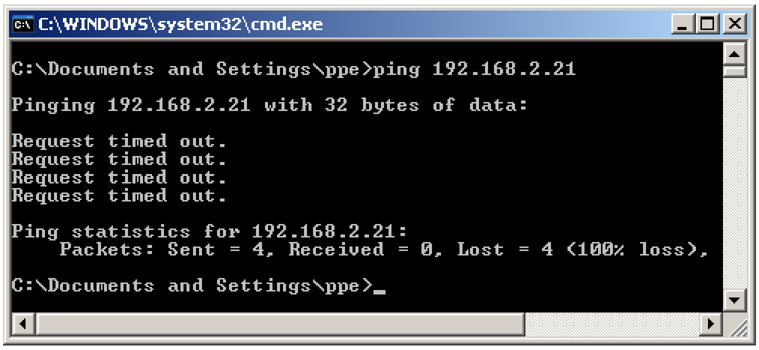
Open: cmd

Type 'ping' and the IP address of the option N processor card (standard is 192.168.2.21) and press the 'Enter' key (see below).



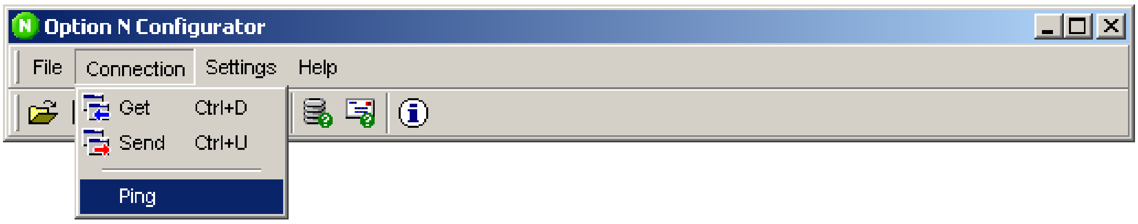
```
C:\Documents and Settings\ppe>ping 192.168.2.21

Pinging 192.168.2.21 with 32 bytes of data:

Reply from 192.168.2.21: bytes=32 time=31ms TTL=254
Reply from 192.168.2.21: bytes=32 time=2ms TTL=254
Reply from 192.168.2.21: bytes=32 time=2ms TTL=254
Reply from 192.168.2.21: bytes=32 time=2ms TTL=254

Ping statistics for 192.168.2.21:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 31ms, Average = 9ms

C:\Documents and Settings\ppe>
```

The above screen dump is displayed when this connection works as it should. Otherwise, it will look like this:

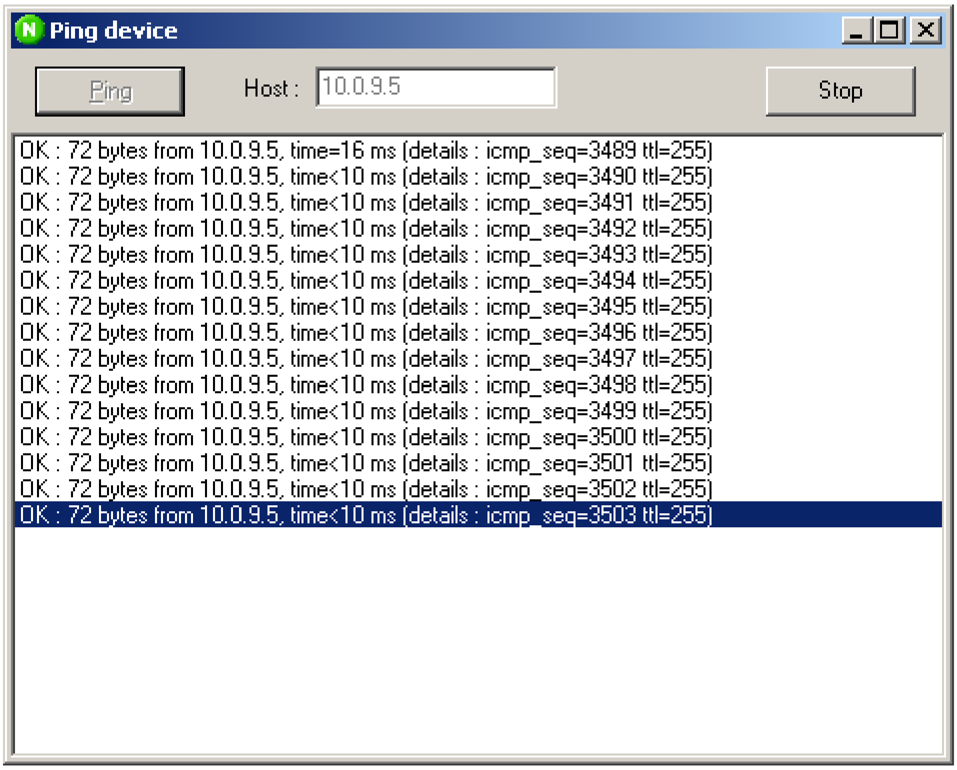


```
C:\Documents and Settings\ppe>ping 192.168.2.21

Pinging 192.168.2.21 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.2.21:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\Documents and Settings\ppe>_
```

This can also be done using the ‘Ping’ menu of the option N configuration software.



Enter the right IP address and press the ‘Ping’ button (see an example below).

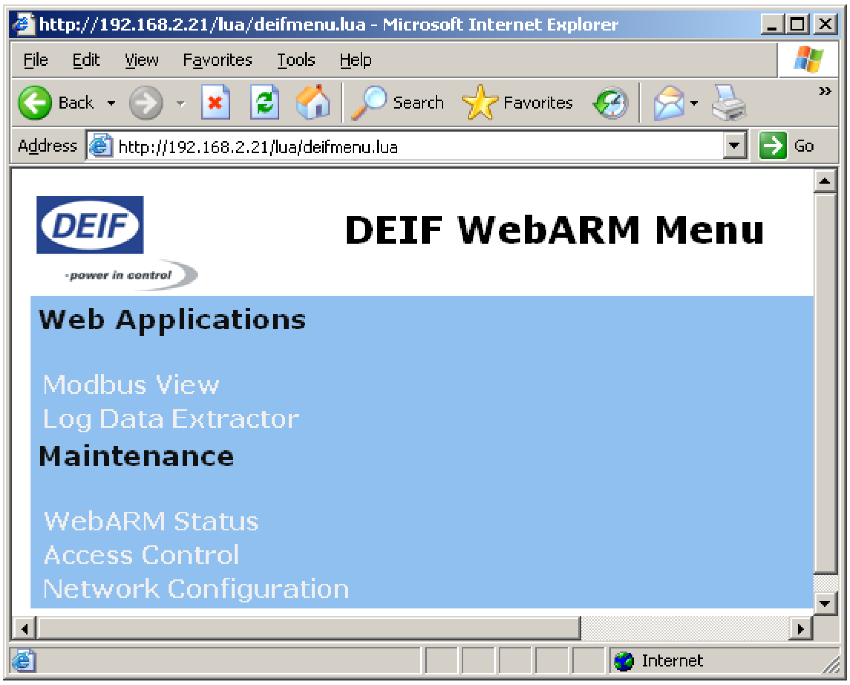


Host : 10.0.9.5

```
OK : 72 bytes from 10.0.9.5, time=16 ms (details : icmp_seq=3489 ttl=255)
OK : 72 bytes from 10.0.9.5, time<10 ms (details : icmp_seq=3490 ttl=255)
OK : 72 bytes from 10.0.9.5, time<10 ms (details : icmp_seq=3491 ttl=255)
OK : 72 bytes from 10.0.9.5, time<10 ms (details : icmp_seq=3492 ttl=255)
OK : 72 bytes from 10.0.9.5, time<10 ms (details : icmp_seq=3493 ttl=255)
OK : 72 bytes from 10.0.9.5, time<10 ms (details : icmp_seq=3494 ttl=255)
OK : 72 bytes from 10.0.9.5, time<10 ms (details : icmp_seq=3495 ttl=255)
OK : 72 bytes from 10.0.9.5, time<10 ms (details : icmp_seq=3496 ttl=255)
OK : 72 bytes from 10.0.9.5, time<10 ms (details : icmp_seq=3497 ttl=255)
OK : 72 bytes from 10.0.9.5, time<10 ms (details : icmp_seq=3498 ttl=255)
OK : 72 bytes from 10.0.9.5, time<10 ms (details : icmp_seq=3499 ttl=255)
OK : 72 bytes from 10.0.9.5, time<10 ms (details : icmp_seq=3500 ttl=255)
OK : 72 bytes from 10.0.9.5, time<10 ms (details : icmp_seq=3501 ttl=255)
OK : 72 bytes from 10.0.9.5, time<10 ms (details : icmp_seq=3502 ttl=255)
OK : 72 bytes from 10.0.9.5, time<10 ms (details : icmp_seq=3503 ttl=255)
```

Then press the ‘Stop’ button and close this window.

When the test has been carried out successfully, you can shut down the command prompt window and open your internet browser (the one shown here is the Microsoft Internet Explorer), type the option N processor card IP address in the internet address field and press the ‘Enter’ key.


http://192.168.2.21/lua/deifmenu.lua - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://192.168.2.21/lua/deifmenu.lua Go
DEIF
-power in control
Internet

DEIF WebARM Menu

Web Applications

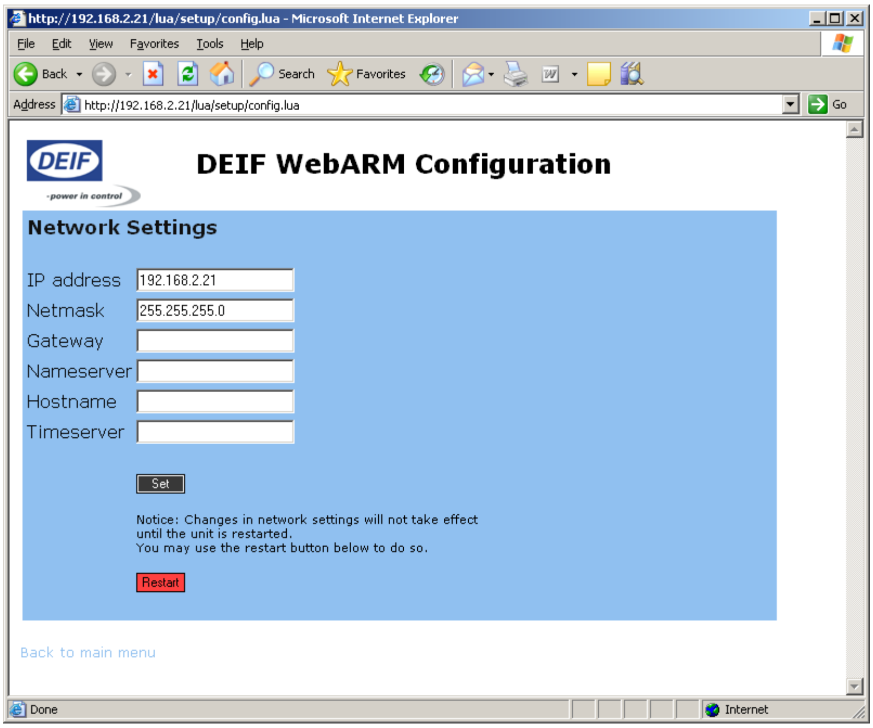
Modbus View
Log Data Extractor

Maintenance

WebARM Status
Access Control
Network Configuration

### Network configuration menu

Click the bottom link called 'Network Configuration' for changing the internet parameter of the option N processor card (user name = admin, password = admin).


http://192.168.2.21/lua/setup/config.lua - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://192.168.2.21/lua/setup/config.lua Go
DEIF
-power in control
Set
Restart
Done
Internet

DEIF WebARM Configuration

Network Settings

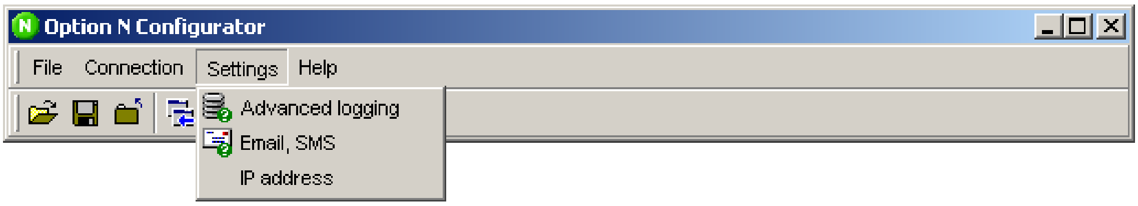
IP address 192.168.2.21
Netmask 255.255.255.0
Gateway
Nameserver
Hostname
Timeserver

Notice: Changes in network settings will not take effect
until the unit is restarted.
You may use the restart button below to do so.

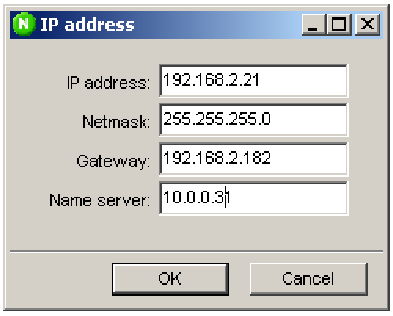
Back to main menu

### Modifying the network configuration from the Option Nx configuration software

It is also possible to modify these parameters from the configuration software. It can be done using the menus ‘Settings’ and ‘IP address’, see below:



The below parameters are read and can be modified here.

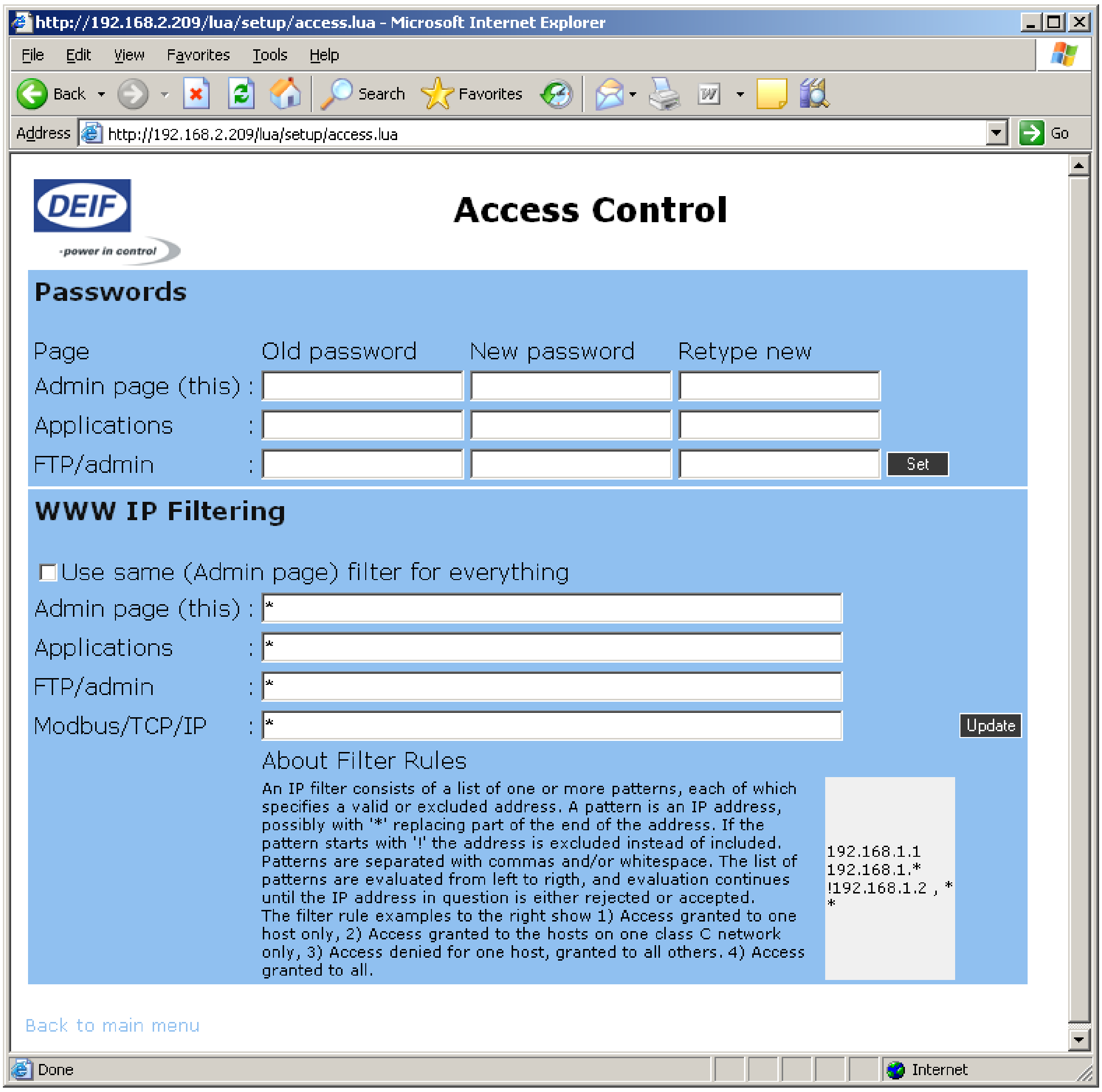


IP address: 192.168.2.21
Netmask: 255.255.255.0
Gateway: 192.168.2.182
Name server: 10.0.0.3

Press the ‘OK’ button for writing the new configuration to the multi-line 2 unit.

## Access control menu

Click the bottom link called 'Access control' for changing the access control parameters of the option N processor card (user name = admin, password = admin).


http://192.168.2.209/lua/setup/access.lua - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://192.168.2.209/lua/setup/access.lua Go
DEIF
-power in control
Done
Internet

# Access Control

## Passwords

| Page | Old password | New password | Retype new | |
|---|---|---|---|---|
| Admin page (this) : | | | | |
| Applications : | | | | |
| FTP/admin : | | | | Set |

## WWW IP Filtering

□ Use same (Admin page) filter for everything

| | |
|---|---|
| Admin page (this) : | * |
| Applications : | * |
| FTP/admin : | * |
| Modbus/TCP/IP : | * |

Update

### About Filter Rules

An IP filter consists of a list of one or more patterns, each of which specifies a valid or excluded address. A pattern is an IP address, possibly with '*' replacing part of the end of the address. If the pattern starts with '!' the address is excluded instead of included. Patterns are separated with commas and/or whitespace. The list of patterns are evaluated from left to rigth, and evaluation continues until the IP address in question is either rejected or accepted.
The filter rule examples to the right show 1) Access granted to one host only, 2) Access granted to the hosts on one class C network only, 3) Access denied for one host, granted to all others. 4) Access granted to all.

```
192.168.1.1
192.168.1.*
!192.168.1.2 , *
*
```

Back to main menu

The first part (Passwords) allows you to modify the passwords of each web page type (Admin, Applications or FTP).

The second part (WWW IP Filtering) allows you to select one or several IP addresses that will be allowed to access the option N processor card for each option N application type. If these fields are left blank, no IP address filter is applied and the option N processor card is accessible by all IP addresses without any restrictions.

# 4. Option N5: TCP/IP Modbus communication

TCP/IP Modbus is identical with the classical serial Modbus communication, except that the media used for this communication is a TCP/IP communication, and it is not possible to send commands to the unit. So the basic Modbus functionalities will not be explained here, but more information can be found in the multi-line 2 option H2 (Modbus option) documentation, which can be downloaded from the DEIF web page www.deif.com.

**Modicon, today Schneider Electric, introduced the Modbus protocol to the market in 1979. Modbus protocol is a messaging structure, and it is used to establish master-slave/client-server communication between intelligent devices. More information is available at www.modbus.org.**

**What is Modbus TCP/IP protocol?**

**TCP/IP is the common transport protocol of the internet and is actually a set of layered protocols, providing a reliable data transport mechanism between machines. Ethernet has become the de facto standard of corporate enterprise systems, so it has also, not surprisingly, become the de facto standard for factory networking. Ethernet is not a new technology. It has matured to the point that the costs of implementing this network solution has dropped to where they are commensurate with those of today's field buses.**

**An open Modbus TCP/IP specification was developed in 1999. The protocol specification and implementation guide are available for download (www.modbus-ida.org/specs.php).**

The useful parameters required from the software you use for communicating with the option N processor card by means of a TCP/IP Modbus communication are:

- The **IP address** of the option N to talk to
- The **port number** to be used

The previous chapters explain the way to set up the IP address parameter of the option N processor card. The port number to be used is: **502**.

## Data list

### Read only words, Modbus function 03 (read holding register)

| Type | Addr. | Designation | Unit | Min. | Max. | Note |
|---|---|---|---|---|---|---|
| PMS | 4371 | DG in 1st priority | | 1 | 8 | |
| PMS | 4372 | DG in 2nd priority | | 1 | 8 | |
| PMS | 4373 | DG in 3rd priority | | 1 | 8 | |
| PMS | 4374 | DG in 4th priority | | 1 | 8 | |
| PMS | 4375 | DG in 5th priority | | 1 | 8 | |
| PMS | 4376 | DG in 6th priority | | 1 | 8 | |
| PMS | 4377 | DG in 7th priority | | 1 | 8 | |
| PMS | 4378 | DG in 8th priority | | 1 | 8 | |
| PMS | 50000 | Active plant mode | - | 0 | 3 | 0 = Semi-auto<br>1 = Auto<br>2 = Shaft<br>3 = Split |
| PMS | 50006 | Nbr. conn. DGs in PMS control | - | 0 | 8 | |
| PMS | 50009 | Base load number | - | 1 | 8 | |
| PMS | 50010 | Base load value | % | 10 | 130 | |
| PMS | 50011 | 1st prior | - | 1 | 8 | |
| PMS | 50012 | 1st stand-by | - | 1 | 8 | |
| PMS | 50013 | Base load selected | - | 0 | 1 | |
| PMS | 50014 | HC acknowledged | - | 1 | 16 | |
| PMS | 50017 | Total available power | kW | | | Dependent on generator size |
| PMS | 50018 | Total consumed power | kW | | | Dependent on generator size |
| Measure | 50019 | DG1 Nominal power | kW | | | |
| Measure | 50020 | DG1 Nominal power | % | | | |
| Measure | 50021 | DG1 Nominal current | A | | | |
| Measure | 50022 | DG1 Nominal voltage | V | | | |
| Measure | 50023 | DG1 Actual rated power P | kW | | | |
| Measure | 50024 | DG1 Actual apparent power S | kVA | | | |
| Measure | 50025 | DG1 Actual reactive power Q | kVAr | | | |
| Measure | 50026 | DG1 Actual current L1 | A | | | |
| Measure | 50030 | DG1 Actual busbar frequency | Hz | | | |
| Measure | 50031 | DG1 Actual busbar voltage | V | | | |
| Measure | 50032 | DG1 Actual cos phi | - | | | |
| Measure | 50033 | DG1 Actual running hours | h | | | |
| Measure | 50034 | DG1 HC 1 max. power | kW | | | |
| Measure | 50035 | DG1 HC 2 max. power | kW | | | |
| Measure | 50036 | DG1 HC 1 variable load | kW | | | |
| Measure | 50037 | DG1 HC 2 variable load | kW | | | |
| Measure | 50038 | DG2 Nominal power | kW | | | |
| Measure | 50039 | DG2 Nominal power | % | | | |
| Measure | 50040 | DG2 Nominal current | A | | | |
| Measure | 50041 | DG2 Nominal voltage | V | | | |
| Measure | 50042 | DG2 Actual rated power P | kW | | | |
| Measure | 50043 | DG2 Actual apparent power S | kVA | | | |
| Measure | 50044 | DG2 Actual reactive power Q | kVAr | | | |
| Measure | 50045 | DG2 Actual current L1 | A | | | |
| Measure | 50049 | DG2 Actual busbar frequency | Hz | | | |

| Type | Addr. | Designation | Unit | Min. | Max. | Note |
|---|---|---|---|---|---|---|
| Measure | 50050 | DG2 Actual busbar voltage | V | | | |
| Measure | 50051 | DG2 Actual cos phi | - | | | |
| Measure | 50052 | DG2 Actual running hours | h | | | |
| Measure | 50053 | DG2 HC 1 max. power | kW | | | |
| Measure | 50054 | DG2 HC 2 max. power | kW | | | |
| Measure | 50055 | DG2 HC 1 variable load | kW | | | |
| Measure | 50056 | DG2 HC 2 variable load | kW | | | |
| Measure | 50057 | DG3 Nominal power | kW | | | |
| Measure | 50058 | DG3 Nominal power | % | | | |
| Measure | 50059 | DG3 Nominal current | A | | | |
| Measure | 50060 | DG3 Nominal voltage | V | | | |
| Measure | 50061 | DG3 Actual rated power P | kW | | | |
| Measure | 50062 | DG3 Actual apparent power S | kVA | | | |
| Measure | 50063 | DG3 Actual reactive power Q | kVAr | | | |
| Measure | 50064 | DG3 Actual current L1 | A | | | |
| Measure | 50068 | DG3 Actual busbar frequency | Hz | | | |
| Measure | 50069 | DG3 Actual busbar voltage | V | | | |
| Measure | 50070 | DG3 Actual cos phi | - | | | |
| Measure | 50071 | DG3 Actual running hours | h | | | |
| Measure | 50072 | DG3 HC 1 max. power | kW | | | |
| Measure | 50073 | DG3 HC 2 max. power | kW | | | |
| Measure | 50074 | DG3 HC 1 variable load | kW | | | |
| Measure | 50075 | DG3 HC 2 variable load | kW | | | |
| Measure | 50076 | DG4 Nominal power | kW | | | |
| Measure | 50077 | DG4 Nominal power | % | | | |
| Measure | 50078 | DG4 Nominal current | A | | | |
| Measure | 50079 | DG4 Nominal voltage | V | | | |
| Measure | 50080 | DG4 Actual rated power P | kW | | | |
| Measure | 50081 | DG4 Actual apparent power S | kVA | | | |
| Measure | 50082 | DG4 Actual reactive power Q | kVAr | | | |
| Measure | 50083 | DG4 Actual current L1 | A | | | |
| Measure | 50087 | DG4 Actual busbar frequency | Hz | | | |
| Measure | 50088 | DG4 Actual busbar voltage | V | | | |
| Measure | 50089 | DG4 Actual cos phi | - | | | |
| Measure | 50090 | DG4 Actual running hours | h | | | |
| Measure | 50091 | DG4 HC 1 max. power | kW | | | |
| Measure | 50092 | DG4 HC 2 max. power | kW | | | |
| Measure | 50093 | DG4 HC 1 variable load | kW | | | |
| Measure | 50094 | DG4 HC 2 variable load | kW | | | |
| Measure | 50095 | DG5 Nominal power | kW | | | |
| Measure | 50096 | DG5 Nominal power | % | | | |
| Measure | 50097 | DG5 Nominal current | A | | | |
| Measure | 50098 | DG5 Nominal voltage | V | | | |
| Measure | 50099 | DG5 Actual rated power P | kW | | | |
| Measure | 50100 | DG5 Actual apparent power S | kVA | | | |
| Measure | 50101 | DG5 Actual reactive power Q | kVAr | | | |
| Measure | 50102 | DG5 Actual current L1 | A | | | |
| Measure | 50106 | DG5 Actual busbar frequency | Hz | | | |
| Measure | 50107 | DG5 Actual busbar voltage | V | | | |
| Measure | 50108 | DG5 Actual cos phi | - | | | |

| Type | Addr. | Designation | Unit | Min. | Max. | Note |
|---|---|---|---|---|---|---|
| Measure | 50109 | DG5 Actual running hours | h | | | |
| Measure | 50110 | DG5 HC 1 max. power | kW | | | |
| Measure | 50111 | DG5 HC 2 max. power | kW | | | |
| Measure | 50112 | DG5 HC 1 variable load | kW | | | |
| Measure | 50113 | DG5 HC 2 variable load | kW | | | |
| Measure | 50114 | DG6 Nominal power | kW | | | |
| Measure | 50115 | DG6 Nominal power | % | | | |
| Measure | 50116 | DG6 Nominal current | A | | | |
| Measure | 50117 | DG6 Nominal voltage | V | | | |
| Measure | 50118 | DG6 Actual rated power P | kW | | | |
| Measure | 50119 | DG6 Actual apparent power S | kVA | | | |
| Measure | 50120 | DG6 Actual reactive power Q | kVAr | | | |
| Measure | 50121 | DG6 Actual current L1 | A | | | |
| Measure | 50125 | DG6 Actual busbar frequency | Hz | | | |
| Measure | 50126 | DG6 Actual busbar voltage | V | | | |
| Measure | 50127 | DG6 Actual cos phi | - | | | |
| Measure | 50128 | DG6 Actual running hours | h | | | |
| Measure | 50129 | DG6 HC 1 max. power | kW | | | |
| Measure | 50130 | DG6 HC 2 max. power | kW | | | |
| Measure | 50131 | DG6 HC 1 variable load | kW | | | |
| Measure | 50132 | DG6 HC 2 variable load | kW | | | |
| Measure | 50133 | DG7 Nominal power | kW | | | |
| Measure | 50134 | DG7 Nominal power | % | | | |
| Measure | 50135 | DG7 Nominal current | A | | | |
| Measure | 50136 | DG7 Nominal voltage | V | | | |
| Measure | 50137 | DG7 Actual rated power P | kW | | | |
| Measure | 50138 | DG7 Actual apparent power S | kVA | | | |
| Measure | 50139 | DG7 Actual reactive power Q | kVAr | | | |
| Measure | 50140 | DG7 Actual current L1 | A | | | |
| Measure | 50144 | DG7 Actual busbar frequency | Hz | | | |
| Measure | 50145 | DG7 Actual busbar voltage | V | | | |
| Measure | 50146 | DG7 Actual cos phi | - | | | |
| Measure | 50147 | DG7 Actual running hours | h | | | |
| Measure | 50148 | DG7 HC 1 max. power | kW | | | |
| Measure | 50149 | DG7 HC 2 max. power | kW | | | |
| Measure | 50150 | DG7 HC 1 variable load | kW | | | |
| Measure | 50151 | DG7 HC 2 variable load | kW | | | |
| Measure | 50152 | DG8 Nominal power | kW | | | |
| Measure | 50153 | DG8 Nominal power | % | | | |
| Measure | 50154 | DG8 Nominal current | A | | | |
| Measure | 50155 | DG8 Nominal voltage | V | | | |
| Measure | 50156 | DG8 Actual rated power P | kW | | | |
| Measure | 50157 | DG8 Actual apparent power S | kVA | | | |
| Measure | 50158 | DG8 Actual reactive power Q | kVAr | | | |
| Measure | 50159 | DG8 Actual current L1 | A | | | |
| Measure | 50163 | DG8 Actual busbar frequency | Hz | | | |
| Measure | 50164 | DG8 Actual busbar voltage | V | | | |
| Measure | 50165 | DG8 Actual cos phi | - | | | |
| Measure | 50166 | DG8 Actual running hours | h | | | |
| Measure | 50167 | DG8 HC 1 max. power | kW | | | |

| Type | Addr. | Designation | Unit | Min. | Max. | Note |
|---|---|---|---|---|---|---|
| Measure | 50168 | DG8 HC 2 max. power | kW | | | |
| Measure | 50169 | DG8 HC 1 variable load | kW | | | |
| Measure | 50170 | DG8 HC 2 variable load | kW | | | |
| Measure | 50171 | TB Nominal power | kW | | | |
| Measure | 50172 | TB Nominal power | % | | | |
| Measure | 50173 | TB Nominal current | A | | | |
| Measure | 50174 | TB Nominal voltage | V | | | |
| Measure | 50175 | TB Actual rated power P | kW | | | |
| Measure | 50176 | TB Actual apparent power S | kVA | | | |
| Measure | 50177 | TB Actual reactive power Q | kVAr | | | |
| Measure | 50178 | TB Actual current L1 | A | | | |
| Measure | 50182 | TB Actual busbar frequency | Hz | | | |
| Measure | 50183 | TB Actual busbar voltage | V | | | |
| Measure | 50184 | TB Actual cos phi | - | | | |
| Measure | 50190 | SG Nominal power | kW | | | |
| Measure | 50191 | SG Nominal power | % | | | |
| Measure | 50192 | SG Nominal current | A | | | |
| Measure | 50193 | SG Nominal voltage | V | | | |
| Measure | 50194 | SG Actual rated power P | kW | | | |
| Measure | 50195 | SG Actual apparent power S | kVA | | | |
| Measure | 50196 | SG Actual reactive power Q | kVAr | | | |
| Measure | 50197 | SG Actual current L1 | A | | | |
| Measure | 50201 | SG Actual busbar frequency | Hz | | | |
| Measure | 50202 | SG Actual busbar voltage | V | | | |
| Measure | 50203 | SG Actual cos phi | - | | | |
| Measure | 50204 | SG Actual running hours | - | | | |
| Measure | 50205 | SG HC 1 max. power | kW | | | |
| Measure | 50206 | SG HC 2 max. power | kW | | | |
| Measure | 50207 | SG HC 1 variable load | kW | | | |
| Measure | 50208 | SG HC 2 variable load | kW | | | |

**Read only bits, Modbus function 01 (read coil status)**

| Type | Addr. | Designation |
|---|---|---|
| PMS | 50000 | PMS processor failure |
| PMS | 50001 | All units forced to SWBD control |
| PMS | 50002 | Common blackout |
| PMS | 50009 | HC 1 Acknowledged SG |
| PMS | 50010 | HC 2 Acknowledged SG |
| Status | 50040 | DG1 Ready for PMS start |
| Status | 50041 | DG1 Ready for PMS stop |
| Status | 50044 | DG1 PMS control selected |
| Alarm | 50045 | DG1 FC warning alarm |
| Alarm | 50046 | DG1 FC block alarm |
| Alarm | 50047 | DG1 FC safety stop |
| Alarm | 50048 | DG1 FC CB tripped |
| Alarm | 50049 | DG1 FC shutdown |
| Alarm | 50050 | DG1 Differential current |
| Alarm | 50051 | DG1 Short circuit |
| Alarm | 50052 | DG1 BUSBAR alarm |
| Alarm | 50053 | DG1 NEL 1 tripped |
| Alarm | 50054 | DG1 NEL 2 tripped |
| Status | 50055 | DG1 CB pos. ON |

| Type | Addr. | Designation |
|---|---|---|
| Status | 50105 | DG2 HC 2 fixed load |
| Status | 50107 | DG2 Synchronising |
| Status | 50108 | DG2 Running feedback |
| Status | 50109 | DG2 HC 1 connected |
| Status | 50110 | DG2 HC 2 connected |
| Alarm | 50111 | DG2 CB ON alarm |
| Alarm | 50112 | DG2 CB OFF alarm |
| Alarm | 50114 | DG2 FC trip/stop |
| Alarm | 50115 | DG2 FC SysAlarm |
| Status | 50120 | DG3 Ready for PMS start |
| Status | 50121 | DG3 Ready for PMS stop |
| Status | 50124 | DG3 PMS control selected |
| Alarm | 50125 | DG3 FC warning alarm |
| Alarm | 50126 | DG3 FC block alarm |
| Alarm | 50127 | DG3 FC safety stop |
| Alarm | 50128 | DG3 FC CB tripped |
| Alarm | 50129 | DG3 FC shutdown |
| Alarm | 50130 | DG3 Differential current |
| Alarm | 50131 | DG3 Short circuit |
| Alarm | 50132 | DG3 BUSBAR alarm |

| Type | Addr. | Designation |
|---|---|---|
| Status | 50056 | DG1 CB pos. OFF |
| Status | 50057 | DG1 Running idle |
| Status | 50062 | DG1 HC 1 start request |
| Status | 50063 | DG1 HC 2 start request |
| Status | 50064 | DG1 HC 1 fixed load |
| Status | 50065 | DG1 HC 2 fixed load |
| Status | 50067 | DG1 Synchronising |
| Status | 50068 | DG1 Running feedback |
| Status | 50069 | DG1 HC 1 connected |
| Status | 50070 | DG1 HC 2 connected |
| Alarm | 50071 | DG1 CB ON alarm |
| Alarm | 50072 | DG1 CB OFF alarm |
| Alarm | 50074 | DG1 FC trip/stop |
| Alarm | 50075 | DG1 FC SysAlarm |
| Status | 50080 | DG2 Ready for PMS start |
| Status | 50081 | DG2 Ready for PMS stop |
| Status | 50084 | DG2 PMS control selected |
| Alarm | 50085 | DG2 FC warning alarm |
| Alarm | 50086 | DG2 FC block alarm |
| Alarm | 50087 | DG2 FC safety stop |
| Alarm | 50088 | DG2 FC CB tripped |
| Alarm | 50089 | DG2 FC shutdown |
| Alarm | 50090 | DG2 Differential current |
| Alarm | 50091 | DG2 Short circuit |
| Alarm | 50092 | DG2 BUSBAR alarm |
| Alarm | 50093 | DG2 NEL 1 tripped |
| Alarm | 50094 | DG2 NEL 2 tripped |
| Status | 50095 | DG2 CB pos. ON |
| Status | 50096 | DG2 CB pos. OFF |
| Status | 50097 | DG2 Running idle |
| Status | 50102 | DG2 HC 1 start request |
| Status | 50103 | DG2 HC 2 start request |
| Status | 50104 | DG2 HC 1 fixed load |
| Status | 50182 | DG4 HC 1 start request |
| Status | 50183 | DG4 HC 2 start request |
| Status | 50184 | DG4 HC 1 fixed load |
| Status | 50185 | DG4 HC 2 fixed load |
| Status | 50187 | DG4 Synchronising |
| Status | 50188 | DG4 Running feedback |
| Status | 50189 | DG4 HC 1 connected |
| Status | 50190 | DG4 HC 2 connected |
| Alarm | 50191 | DG4 CB ON alarm |
| Alarm | 50192 | DG4 CB OFF alarm |
| Alarm | 50194 | DG4 FC trip/stop |
| Alarm | 50195 | DG4 FC SysAlarm |
| Status | 50200 | DG5 Ready for PMS start |
| Status | 50201 | DG5 Ready for PMS stop |
| Status | 50204 | DG5 PMS control selected |
| Alarm | 50205 | DG5 FC warning alarm |
| Alarm | 50206 | DG5 FC block alarm |
| Alarm | 50207 | DG5 FC safety stop |
| Alarm | 50208 | DG5 FC CB tripped |
| Alarm | 50209 | DG5 FC shutdown |
| Alarm | 50210 | DG5 Differential current |

| Type | Addr. | Designation |
|---|---|---|
| Alarm | 50133 | DG3 NEL 1 tripped |
| Alarm | 50134 | DG3 NEL 2 tripped |
| Status | 50135 | DG3 CB pos. ON |
| Status | 50136 | DG3 CB pos. OFF |
| Status | 50137 | DG3 Running idle |
| Status | 50142 | DG3 HC 1 start request |
| Status | 50143 | DG3 HC 2 start request |
| Status | 50144 | DG3 HC 1 fixed load |
| Status | 50145 | DG3 HC 2 fixed load |
| Status | 50147 | DG3 Synchronising |
| Status | 50148 | DG3 Running feedback |
| Status | 50149 | DG3 HC 1 connected |
| Status | 50150 | DG3 HC 2 connected |
| Alarm | 50151 | DG3 CB ON alarm |
| Alarm | 50152 | DG3 CB OFF alarm |
| Alarm | 50154 | DG3 FC trip/stop |
| Alarm | 50155 | DG3 FC SysAlarm |
| Status | 50160 | DG4 Ready for PMS start |
| Status | 50161 | DG4 Ready for PMS stop |
| Status | 50164 | DG4 PMS control selected |
| Alarm | 50165 | DG4 FC warning alarm |
| Alarm | 50166 | DG4 FC block alarm |
| Alarm | 50167 | DG4 FC safety stop |
| Alarm | 50168 | DG4 FC CB tripped |
| Alarm | 50169 | DG4 FC shutdown |
| Alarm | 50170 | DG4 Differential current |
| Alarm | 50171 | DG4 Short circuit |
| Alarm | 50172 | DG4 BUSBAR alarm |
| Alarm | 50173 | DG4 NEL 1 tripped |
| Alarm | 50174 | DG4 NEL 2 tripped |
| Status | 50175 | DG4 CB pos. ON |
| Status | 50176 | DG4 CB pos. OFF |
| Status | 50177 | DG4 Running idle |
| Status | 50256 | DG6 CB pos. OFF |
| Status | 50257 | DG6 Running idle |
| Status | 50262 | DG6 HC 1 start request |
| Status | 50263 | DG6 HC 2 start request |
| Status | 50264 | DG6 HC 1 fixed load |
| Status | 50265 | DG6 HC 2 fixed load |
| Status | 50267 | DG6 Synchronising |
| Status | 50268 | DG6 Running feedback |
| Status | 50269 | DG6 HC 1 connected |
| Status | 50270 | DG6 HC 2 connected |
| Alarm | 50271 | DG6 CB ON alarm |
| Alarm | 50272 | DG6 CB OFF alarm |
| Alarm | 50274 | DG6 FC trip/stop |
| Alarm | 50275 | DG6 FC SysAlarm |
| Status | 50280 | DG7 Ready for PMS start |
| Status | 50281 | DG7 Ready for PMS stop |
| Status | 50284 | DG7 PMS control selected |
| Alarm | 50285 | DG7 FC warning alarm |
| Alarm | 50286 | DG7 FC block alarm |
| Alarm | 50287 | DG7 FC safety stop |
| Alarm | 50288 | DG7 FC CB tripped |

| Type | Addr. | Designation |
|---|---|---|
| Alarm | 50211 | DG5 Short circuit |
| Alarm | 50212 | DG5 BUSBAR alarm |
| Alarm | 50213 | DG5 NEL 1 tripped |
| Alarm | 50214 | DG5 NEL 2 tripped |
| Status | 50215 | DG5 CB pos. ON |
| Status | 50216 | DG5 CB pos. OFF |
| Status | 50217 | DG5 Running idle |
| Status | 50222 | DG5 HC 1 start request |
| Status | 50223 | DG5 HC 2 start request |
| Status | 50224 | DG5 HC 1 fixed load |
| Status | 50225 | DG5 HC 2 fixed load |
| Status | 50227 | DG5 Synchronising |
| Status | 50228 | DG5 Running feedback |
| Status | 50229 | DG5 HC 1 connected |
| Status | 50230 | DG5 HC 2 connected |
| Alarm | 50231 | DG5 CB ON alarm |
| Alarm | 50232 | DG5 CB OFF alarm |
| Alarm | 50234 | DG5 FC trip/stop |
| Alarm | 50235 | DG5 FC SysAlarm |
| Status | 50240 | DG6 Ready for PMS start |
| Status | 50241 | DG6 Ready for PMS stop |
| Status | 50244 | DG6 PMS control selected |
| Alarm | 50245 | DG6 FC warning alarm |
| Alarm | 50246 | DG6 FC block alarm |
| Alarm | 50247 | DG6 FC safety stop |
| Alarm | 50248 | DG6 FC CB tripped |
| Alarm | 50249 | DG6 FC shutdown |
| Alarm | 50250 | DG6 Differential current |
| Alarm | 50251 | DG6 Short circuit |
| Alarm | 50252 | DG6 BUSBAR alarm |
| Alarm | 50253 | DG6 NEL 1 tripped |
| Alarm | 50254 | DG6 NEL 2 tripped |
| Status | 50255 | DG6 CB pos. ON |
| Alarm | 50334 | DG8 NEL 2 tripped |
| Status | 50335 | DG8 CB pos. ON |
| Status | 50336 | DG8 CB pos. OFF |
| Status | 50337 | DG8 Running idle |
| Status | 50342 | DG8 HC 1 start request |
| Status | 50343 | DG8 HC 2 start request |
| Status | 50344 | DG8 HC 1 fixed load |
| Status | 50345 | DG8 HC 2 fixed load |
| Status | 50347 | DG8 Synchronising |
| Status | 50348 | DG8 Running feedback |
| Status | 50349 | DG8 HC 1 connected |
| Status | 50350 | DG8 HC 2 connected |
| Alarm | 50351 | DG8 CB ON alarm |
| Alarm | 50352 | DG8 CB OFF alarm |
| Alarm | 50354 | DG8 FC trip/stop |
| Alarm | 50355 | DG8 FC SysAlarm |
| Status | 50364 | TB PMS control selected |
| Alarm | 50365 | TB FC warning alarm |
| Alarm | 50366 | TB FC block alarm |
| Alarm | 50368 | TB FC CB tripped |
| Alarm | 50371 | TB short circuit |

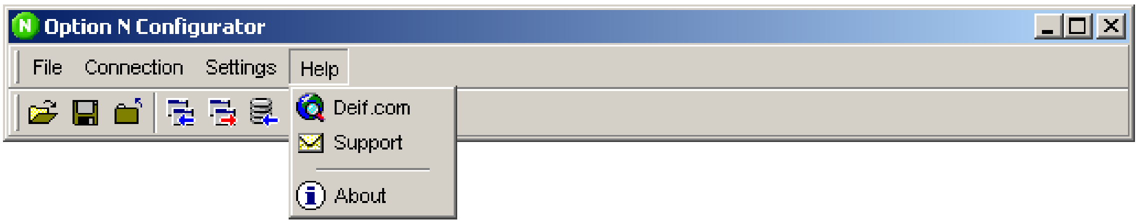
| Type | Addr. | Designation |
|---|---|---|
| Alarm | 50289 | DG7 FC shutdown |
| Alarm | 50290 | DG7 Differential current |
| Alarm | 50291 | DG7 Short circuit |
| Alarm | 50292 | DG7 BUSBAR alarm |
| Alarm | 50293 | DG7 NEL 1 tripped |
| Alarm | 50294 | DG7 NEL 2 tripped |
| Status | 50295 | DG7 CB pos. ON |
| Status | 50296 | DG7 CB pos. OFF |
| Status | 50297 | DG7 Running idle |
| Status | 50302 | DG7 HC 1 start request |
| Status | 50303 | DG7 HC 2 start request |
| Status | 50304 | DG7 HC 1 fixed load |
| Status | 50305 | DG7 HC 2 fixed load |
| Status | 50307 | DG7 Synchronising |
| Status | 50308 | DG7 Running feedback |
| Status | 50309 | DG7 HC 1 connected |
| Status | 50310 | DG7 HC 2 connected |
| Alarm | 50311 | DG7 CB ON alarm |
| Alarm | 50312 | DG7 CB OFF alarm |
| Alarm | 50314 | DG7 FC trip/stop |
| Alarm | 50315 | DG7 FC SysAlarm |
| Status | 50320 | DG8 Ready for PMS start |
| Status | 50321 | DG8 Ready for PMS stop |
| Status | 50324 | DG8 PMS control selected |
| Alarm | 50325 | DG8 FC warning alarm |
| Alarm | 50326 | DG8 FC block alarm |
| Alarm | 50327 | DG8 FC safety stop |
| Alarm | 50328 | DG8 FC CB tripped |
| Alarm | 50329 | DG8 FC shutdown |
| Alarm | 50330 | DG8 Differential current |
| Alarm | 50331 | DG8 Short circuit |
| Alarm | 50332 | DG8 BUSBAR alarm |
| Alarm | 50333 | DG8 NEL 1 tripped |
| Alarm | 50392 | TB CB OFF alarm |
| Alarm | 50395 | TB FC SysAlarm |
| Status | 50404 | SG PMS control selected |
| Alarm | 50405 | SG FC warning alarm |
| Alarm | 50406 | SG FC block alarm |
| Alarm | 50407 | SG FC safety stop |
| Alarm | 50408 | SG FC CB tripped |
| Alarm | 50410 | SG Differential current |
| Alarm | 50411 | SG Short circuit |
| Alarm | 50412 | SG BUSBAR alarm |
| Alarm | 50413 | SG NEL 1 tripped |
| Alarm | 50414 | SG NEL 2 tripped |
| Status | 50415 | SG CB pos. ON |
| Status | 50416 | SG CB pos. OFF |
| Status | 50422 | SG HC 1 start request |
| Status | 50423 | SG HC 2 start request |
| Status | 50424 | SG HC 1 fixed load |
| Status | 50425 | SG HC 2 fixed load |
| Status | 50427 | SG Synchronising |
| Status | 50428 | SG Running feedback |
| Status | 50429 | SG HC 1 connected |

| Type | Addr. | Designation |
|---|---|---|
| Alarm | 50372 | TB BUSBAR alarm |
| Status | 50375 | TB CB pos. ON |
| Status | 50376 | TB CB pos. OFF |
| Status | 50387 | TB Synchronising |
| Alarm | 50391 | TB CB ON alarm |
| | | |

| Type | Addr. | Designation |
|---|---|---|
| Status | 50430 | SG HC 2 connected |
| Alarm | 50431 | SG CB ON alarm |
| Alarm | 50432 | SG CB OFF alarm |
| Alarm | 50435 | SG FC SysAlarm |
| | | |
| | | |

## Getting help

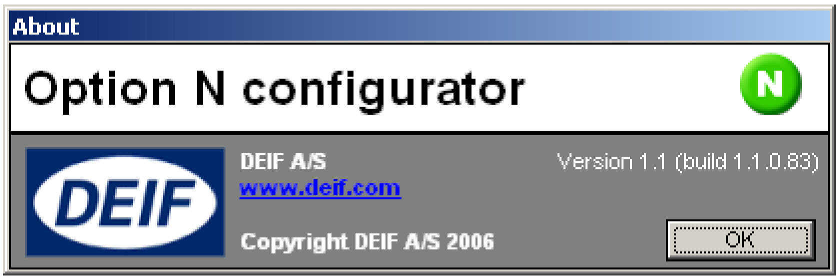
Just press the 'Help' menu of the option N configuration software.



Deif.com >>> Brings you to the DEIF web page.

Support >>> Contact the DEIF support department by e-mail.

About, or pressing the ⓘ icon, will display the window below:



Option N configurator

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It informs about the option N configuration software version (here, it is the software version 1.0.0.81). By clicking on the DEIF logo or the DEIF internet link you will get to the DEIF internet web site. Press the 'OK' button for closing this window.

# 5. Glossary of terms

## Firewall

In computer science, a firewall is a piece of hardware and/or software which functions in a networked environment to prevent some communications forbidden by the security policy, analogue to the function of firewalls in building construction. A firewall is also called a Border Protection Device (BPD), especially in NATO contexts, or packet filter in BSD contexts. A firewall has the basic task of controlling traffic between different zones of trust. Typical zones of trust include the internet (a zone with no trust) and an internal network (a zone with high trust). The ultimate goal is to provide controlled connectivity between zones of differing trust levels through the enforcement of a security policy and connectivity model based on the least privilege principle.

Proper configuration of firewalls demands skill from the administrator. It requires considerable understanding of network protocols and of computer security. Small mistakes can render a firewall worthless as a security tool.

## FTP (File Transfer Protocol)

FTP or file transfer protocol is a commonly used protocol for exchanging files over any network that supports the TCP/IP protocol (such as the internet or an intranet). There are two computers involved in an FTP transfer: A server and a client. The FTP server, running FTP server software, listens on the network for connection requests from other computers. The client computer, running FTP client software, initiates a connection to the server. Once connected, the client can do a number of file manipulation operations such as upload files to the server, download files from the server, rename or delete files on the server and so on. Any software company or individual programmer is able to create FTP server or client software, because the protocol is an open standard. Virtually every computer platform supports the FTP protocol. This allows any computer connected to a TCP/IP based network to manipulate files on another computer on that network, no matter which operating systems are involved (if the computers permit FTP access). There are many existing FTP client and server programs, and many of these are free of charge.

## Gateway

In telecommunications, the term gateway has the following meanings:

- In a communications network, a network node equipped for interfacing with another network that uses different protocols.
  - A gateway may contain devices such as protocol translators, impedance matching devices, rate converters, fault isolators or signal translators as necessary to provide system interoperability. It also requires the establishment of mutually acceptable administrative procedures between the two networks.
  - A protocol translation/mapping gateway interconnects networks with different network protocol technologies by performing the required protocol conversions.
- Loosely, a computer configured to perform the tasks of a gateway. For a specific case, see default gateway.

Routers exemplify special cases of gateways.

Gateways, also called protocol converters, can operate at any layer of the OSI model. The job of a gateway is much more complex than that of a router or switch. Typically, a gateway must convert one protocol stack into another.

## HTTP (Hypertext Transfer Protocol)

Hypertext Transfer Protocol (HTTP) is a method used to transfer or convey information on the World Wide Web. Its original purpose was to provide a way to publish and retrieve HTML pages.

Development of HTTP was coordinated by the World Wide Web Consortium and the Internet Engineering Task Force, culminating in the publication of a series of RFCs, most notably RFC 2616, which defines HTTP/1.1, the version of HTTP in common use today.

HTTP is a request/response protocol between clients and servers. The originating client, such as a web browser, spider or other end-user tool, is referred to as the user agent. The destination server, which stores or creates resources such as HTML files and images, is called the origin server. In between the user agent and origin server may be several intermediaries, such as proxies, gateways and tunnels.

An HTTP client initiates a request by establishing a Transmission Control Protocol (TCP) connection to a particular port on a remote host (port 80 by default, see List of TCP and UDP port numbers). An HTTP server listening on that port waits for the client to send a request message.

Upon receiving the request, the server sends back a status line, such as ‘HTTP/1.1 200 OK’, and a message of its own, the body of which is perhaps the requested file, an error message or some other information.

Resources to be accessed by HTTP are identified using Uniform Resource Identifiers (URIs) (or, more specifically, URLs) using the http: or https URI schemes.

## IP address (Internet Protocol address)

An IP address is a unique number that devices use in order to identify and communicate with each other on a computer network utilising the Internet Protocol standard (IP). Any participating network device - including routers, computers, time-servers, printers, internet fax machines and some telephones - must have its own unique address. An IP address can also be seen as the equivalent of a street address or a phone number (compare: VoIP) for a computer or other network device on the internet. Just as each street address and phone number uniquely identifies a building or telephone, an IP address can uniquely identify a specific computer or other network device on a network.

An IP address can appear to be shared by multiple client devices, either because they are part of a shared hosting web server environment or because a proxy server (e.g. an ISP or anonymiser service) acts as an intermediary agent on behalf of its customers, in which case the real originating IP addresses might be hidden from the server receiving a request. The analogy to telephone systems would be the use of predial numbers (proxy) and extensions (shared).

IP addresses are managed by the Internet Assigned Numbers Authority. IANA generally assigns super-blocks to Regional Internet Registries, who in turn allocate smaller blocks to Internet Service Providers and enterprises.

## Modbus

(See the N5 option description).

Modbus is a serial communications protocol published by Modicon in 1979 for use with its programmable logic controllers (PLCs). It has become a de facto standard communications protocol in industry and is now the most commonly available means of connecting industrial electronic devices. The main reasons for the extensive use of Modbus over other communications protocols are:

1. It is openly published and royalty-free
2. It can be implemented in days, not months
3. It moves raw bits or words without placing many restrictions on vendors

Modbus allows for communication between many devices connected to the same network, for example a system that measures temperature and humidity and communicates the results to a computer. Modbus is often used to connect a supervisory computer with a remote terminal unit (RTU) in supervisory control and data acquisition (SCADA) systems. Versions of the Modbus protocol exist for serial port and Ethernet.

Two variants exist, with different representations of numerical data and slightly different protocol details. Modbus RTU is a compact, binary representation of the data. Modbus ASCII is human readable and more verbose. Both of these variants use serial communication. The RTU format follows the commands/data with a cyclic redundancy check check sum, while the ASCII format uses a longitudinal redundancy check check sum. Nodes configured for the RTU variant will not communicate with nodes set for ASCII, and vice versa. Modbus/TCP is very similar to Modbus RTU, but transmits the protocol packets within TCP/IP data packets.

An extended version, Modbus Plus (Modbus+ or MB+), also exists, but remains proprietary to Modicon. It requires a dedicated co-processor to handle fast HDLC-like token rotation. It uses twisted pair at 1 Mbit/s and includes transformer isolation at each node, which makes it transition/edge triggered instead of voltage/level triggered. Special interfaces are required to connect Modbus Plus to a computer serial port.

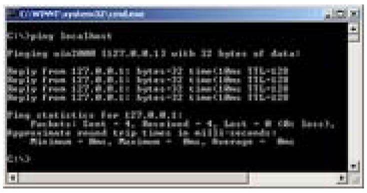
Each device intended to communicate using Modbus is given a unique address. Any device can send out a Modbus command, although usually only one master device does so. A Modbus command contains the Modbus address of the device it is intended for. Only the intended device will act on the command, even though other devices might receive it. All Modbus commands contain checking information, ensuring that a command arrives undamaged. The basic Modbus commands can instruct an RTU to change a value in one of its registers as well as command the device to send back one or more values contained in its registers.

There are many modems that support Modbus. Some of them were specifically designed for this protocol. Different implementations use wires, wireless communication and even SMS or GPRS. Typical problems the designers have to overcome include high latency and timing problems.

## PC (Personal Computer)

PC is usually a micro-computer whose price, size and capabilities make it suitable for personal use. The term was popularised by Apple Computer with the Apple II in the late 1970s and early 1980s, and afterwards by IBM with the IBM PC.

## Ping



```
C:\>ping localhost

Pinging win2000 [127.0.0.1] with 32 bytes of data:

Reply from 127.0.0.1: bytes=32 time<10ms TTL=128
Reply from 127.0.0.1: bytes=32 time<10ms TTL=128
Reply from 127.0.0.1: bytes=32 time<10ms TTL=128
Reply from 127.0.0.1: bytes=32 time<10ms TTL=128

Ping statistics for 127.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum =  0ms, Average =  0ms

C:\>
```

Ping in a Windows 2000 command window.

Ping is a computer network tool used to test whether a particular host is reachable across an IP network. Ping works by sending ICMP ‘echo request’ packets (‘Ping?’) to the target host and listening for ICMP ‘echo response’ replies (sometimes dubbed ‘Pong!’ as an analogue from the Ping Pong table tennis sport). Using interval timing and response rate, Ping estimates the round-trip time and packet loss (if any) rate between hosts.

## Port (TCP and UDP port)

In the TCP and UDP protocols used in computer networking, a port is a special number present in the header of a data packet. Ports are typically used to map data to a particular process running on a computer. As an example, a server used for sending and receiving e-mail may provide both an SMTP and a POP3 service. These will be handled by different server processes, and the port number will be used to determine which data are associated with which process. This may be considered loosely analogous to simulating the effect of a single server with multiple physical connections. Note that not all transport layers use network ports; for example, although UDP and TCP use ports, ICMP does not.

In both TCP and UDP, each packet header will specify a source port and a destination port, each of which is a 16-bit unsigned integer (i.e. ranging from 0 to 65535), as well as it will specify the source and destination network addresses (IP numbers) among other things. A process may ‘bind’ to a particular port to send and receive data, meaning that it will listen for incoming packets whose destination port matches that port number, and/or send outgoing packets whose source port is set to that port number. Processes may also bind to multiple ports.

Applications implementing common services will normally listen on specific port numbers which have been defined by convention for use with the given protocol - see list of TCP and UDP port numbers. Typically, these will be low port numbers, and in Unix only processes owned by the superuser can listen on port numbers from 0 to 1023; this is for security to prevent untrusted processes from acting as system services. Conversely, the client end of the connection will typically use a varying high port number.

Because the port number forms part of the packet header, it is readily interpreted not only by the sending and receiving computers, but also by other aspects of the networking infrastructure. In particular, firewalls (whether implemented in hardware or software) are commonly configured to respond differently to packets depending on their source and/or destination port numbers. Port forwarding is one application of this.

Processes implement connections to TCP and UDP ports by means of sockets. A socket is a transport end-point, which a process can create and then bind to a socket address. In TCP or UDP a socket address consists of a combination of a port and an IP number. Sockets may be set to send/receive data in one direction at a time, called half duplex, or simultaneously in both directions, called full duplex. (Besides TCP and UDP ports, sockets may also be bound to software network ports to connect internal programs on a single computer system.)

Because different services commonly listen on different port numbers as discussed, the practice of attempting to connect in sequence to a wide range of services on a single computer is commonly known as port scanning. This is usually associated either with malicious cracking attempts or with a search for possible vulnerabilities to help prevent such attacks.

## Proxy server

A proxy server is a computer that offers a computer network service to allow clients to make indirect network connections to other network services. A client connects to the proxy server, then requests a connection, file or other resource available on a different server. The proxy provides the resource either by connecting to the specified server or by serving it from a cache. In some cases, the proxy may alter the client's request or the server's response for various purposes. A proxy server can also serve as a firewall.

## SMTP (Simple Mail Transfer Protocol)

SMTP is the de facto standard for e-mail transmissions across the internet. Formally, SMTP is defined in RFC 821 (STD 10) as amended by RFC 1123 (STD 3) chapter 5. The protocol used today is also known as ESMTP and is defined in RFC 2821.

## Subnet mask

Subnetwork

The word subnetwork (usually shortened to subnet) has two related meanings. In the older and more general meaning, it meant one physical network of an internetwork. In the Internet Protocol (IP), a subnetwork is a division of a classful network. The rest of this article is about the second meaning of the term.

Subnetting an IP network allows a single large network to be broken down into what appears (logically) to be several smaller ones. It was originally introduced before the introduction of classful network numbers in IPv4, to allow a single site to have a number of local area networks. Even after the introduction of classful network numbers, subnetting continued to be useful, as it reduced the number of entries in the internet-wide routing table (by hiding information about all the individual subnets inside a site). As a side benefit, it also resulted in reduced network overhead by dividing the parts which receive IP broadcasts.

Network masks

A network mask, also known as a subnet mask, netmask or address mask, is a bitmask used to tell how many bits in an octet(s) identify the subnetwork, and how many bits provide room for host addresses. They are typically used to determine whether to send a packet to the MAC address of the default gateway (for packets with destinations outside the subnet) or of the actual machine (for inside the subnet), as determined by ARP.

Subnet masks are usually represented in the same representation used for addresses themselves; in IPv4, dotted decimal notation, four numbers from zero to 255 separated by periods, e.g. 255.128.0.0. Since the mask consists of only a series of all ones followed by all zeroes, only those numbers representing such sequences are allowed: 0, 128, 192, 224, 240, 248, 252, 254, and 255. Less commonly, it can be represented as an eight-digit hexadecimal number (e.g. FF.80.00.00 = 255.128.0.0).

A shorter form, which is known as Classless Inter-Domain Routing (CIDR) notation, gives the network number followed by a slash (‘/’) and the number of 'one' bits in the binary notation of the netmask (i.e. the number of relevant bits in the network number). For example, 192.0.2.96/28 indicates an IP address where the first 28 bits are used as the network address (same as 255.255.255.240).

Subnetworking concept

IPv4 addresses are broken down into three parts: The network part, the subnet part (now often considered part of the network part, although originally it was part of the rest part) and the host part. There are three classes of IP addresses which determine how much is which.

| Class | Leading bits | Start | End | Default Subnet Mask in dotted decimal | CIDR notation |
|---|---|---|---|---|---|
| A | 0 | 1.0.0.0 | 126.0.0.0 | 255.0.0.0 | /8 |
| B | 10 | 128.0.0.0 | 191.255.0.0 | 255.255.0.0 | /16 |
| C | 110 | 192.0.0.0 | 223.255.255.0 | 255.255.255.0 | /24 |
| D | 1110 | 224.0.0.0 | 239.255.255.0 | | |
| E | 1111 | 240.0.0.0 | 255.255.255.0 | | |

The 127.0.0.1 Network ID is left out, because it is designated for loopback and cannot be assigned to a network, Class D multicasting, Class E reserved.

Subnetting is the process of allocating bits from the host portion as a network portion. For example, giving the class A network 10.0.0.0 a subnet mask of 255.255.0.0 would break it down into 256 subnetworks (10.0.0.0 to 10.0.255.0) and indicates that the first octet of the IP address shows the network address, the second one shows the subnet number and the last two show the host part. A bitwise AND operation of the host address with the subnet mask extracts the complete subnetwork address (see example below).

Subnet masks are not limited to whole octets either. For example, 255.254.0.0 (or /15) is also a valid mask. Applied to a class A address this would create 128 subnetworks in intervals of two (1.2.0.1 - 1.3.255.254, 1.4.0.1 - 1.5.255.254, etc).

## TCP/IP

The internet protocol suite is the set of communications protocols that implement the protocol stack on which the internet and most commercial networks run. It is sometimes called the TCP/IP protocol suite, after the two most important protocols: The Transmission Control Protocol (TCP) and the Internet Protocol (IP), which were also the first two defined.

The Internet protocol suite - like many protocol suites - can be viewed as a set of layers. Each layer solves a set of problems involving the transmission of data and provides a well-defined service to the upper layer protocols based on using services from some lower layers. Upper layers are logically closer to the user and deal with more abstract data, relying on lower layer protocols to translate data into forms that can eventually be physically transmitted.

The OSI model describes a fixed, seven layer stack for networking protocols. Comparisons between the OSI model and TCP/IP can give further insight into the significance of the components of the IP suite, but can also cause confusion, as TCP/IP consists of only 4 layers.

## TCP/IP Modbus

(See the N5 option description).

## USB (Universal Serial Bus)

USB is a serial bus standard to interface devices. It was designed for computers such as PCs and the Apple Macintosh, but its popularity has prompted it to also become commonplace on video game consoles, PDAs, cellphones and even devices such as television sets and home stereo equipment (e.g. mp3 players) and portable memory devices.

The radio spectrum-based USB implementation is known as Wireless USB.

DEIF A/S reserves the right to change any of the above