DEIF

-power in control

$C\,E$

APPLICATION NOTES

Protection and Power Management, PPM-3
DNV approved systems
- Application description
- Application verification

1. General information

2. Application information

1. General information

1.1 Warnings, legal information and safety

1.1.1 Warnings and notes

Throughout this document, a number of warnings and notes with helpful user information will be presented. To ensure that these are noticed, they will be highlighted as follows in order to separate them from the general text.

Warnings

⚠ **Warnings indicate a potentially dangerous situation, which could result in death, personal injury or damaged equipment, if certain guidelines are not followed.**

Notes

ⓘ **Notes provide general information, which will be helpful for the reader to bear in mind.**

1.1.2 Legal information and disclaimer

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 2 unit is not to be opened by unauthorised personnel. If opened anyway, the warranty will be lost.**

Disclaimer

DEIF A/S reserves the right to change any of the contents of this document without prior notice.

1.1.3 Safety issues

Installing and operating 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.

⚠ **Be aware of the hazardous live currents and voltages. Do not touch any AC measurement inputs as this could lead to injury or death.**

1.1.4 Electrostatic discharge awareness

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

1.1.5 Factory settings

The Multi-line 2 unit is delivered from factory with certain factory settings. These are based on average values and are not necessarily the correct settings for matching the engine/generator set in question. Precautions must be taken to check the settings before running the engine/generator set.

1.2 About the Application Notes

1.2.1 General purpose
This document includes application notes for DEIF's Multi-line 2 unit. It mainly includes examples of different applications suitable for the unit.

(i) **See the Designer's Reference Handbook for functional descriptions, the procedure for parameter setup, parameter lists, etc.**

The general purpose of the application notes is to offer the designer information about suitable applications for the Multi-line 2 unit.

⚠ **Make sure that you read this document before you start working with the Multi-line 2 unit and the genset to be controlled. Failure to do this could result in human injury or damage to the equipment.**

1.2.2 Intended users
The Application Notes are mainly intended for the person responsible for designing Multi-line 2 systems. In most cases, this would be a panel builder designer. Naturally, other users might also find useful information in this document.

1.2.3 Contents and overall structure
This document is divided into chapters, and in order to make the structure simple and easy to use, each chapter will begin from the top of a new page.

2. Application information

2.1 Application overview and descriptions

2.1.1 Application overview

Application	Application overview	Comments
Application 1	DG 1 + DG 2 + DG 3 (up to 16)	Maximum 16 diesel generators
Application 2	DG 1 + DG 2 + DG # (3-16) + SG/SC	Maximum 16 diesel generators and one shaft generator/shore connection
Application 3	DG 1 + DG 2 + DG # (3-16) + SG/SC + BTB	Maximum 16 diesel generators, one shaft generator/shore connection and one bus tie breaker
Application 4	DG 1 + DG 2 + DG 3 + DG 4 + DG # (5-16) + BTB + BTB # (up to 8)	Maximum 16 diesel generators and eight bus tie breakers

2.1.2 Application 1: 3 DGs
System overview
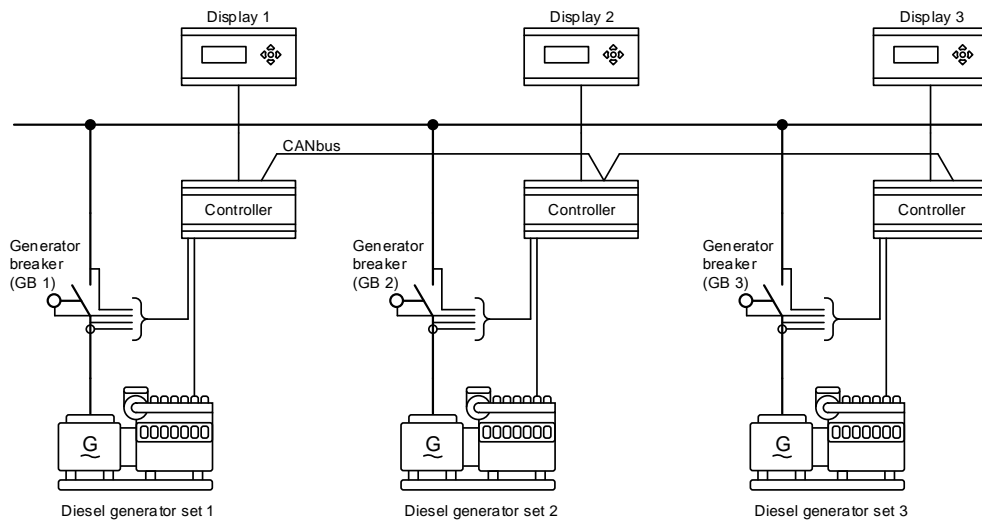
By default, this application supports three diesel generators (DGs) in parallel operation as illustrated above. The number of DGs can be extended to 16.

The main functions of the system are:

1. Engine start/stop
2. Synchronisation of generator breakers (GBs)
3. Load sharing
4. Generator protection
5. Busbar protection
6. Load-dependent start/stop
7. Priority handling
8. Heavy consumer (HC) control
9. Blackout detection and start of standby genset(s)

Required hardware
To support this application, the following hardware is required:
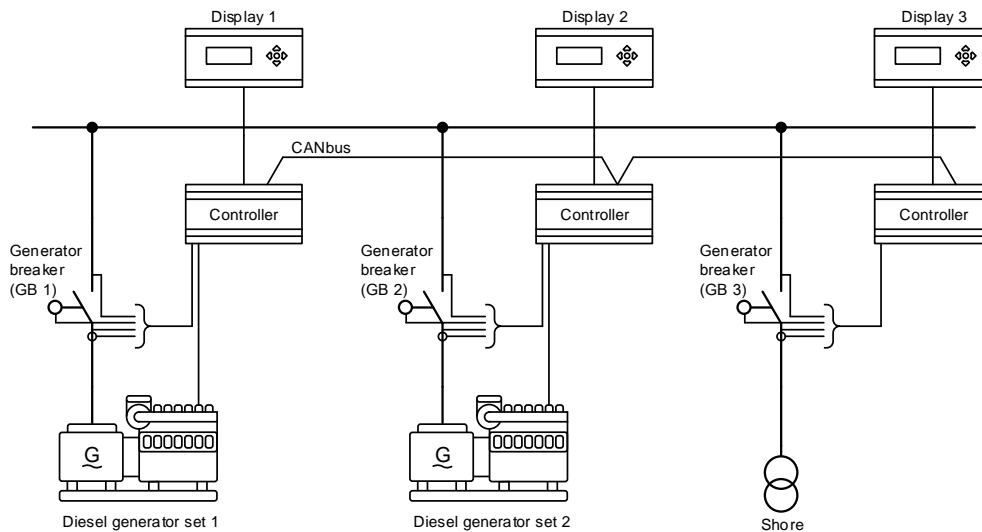
3 × PPM-3 DG units (dependent on number of DGs)

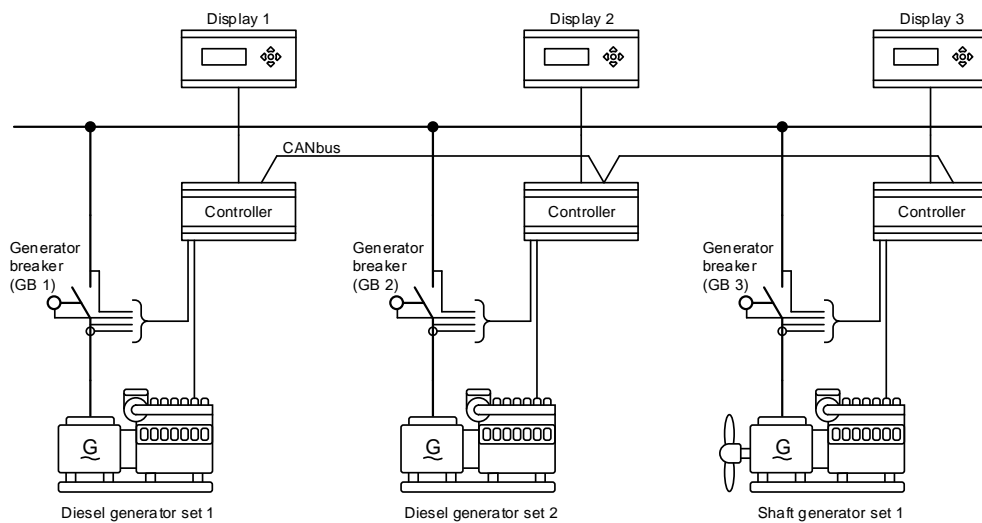ⓘ   **Refer to www.deif.com for a complete list of available options.**

2.1.3 Application 2: 2 DGs and 1 SG/SC

System overview

Application with shore connection (SC)

Application with shaft generator (SG)

By default, this application supports two diesel generators (DGs) in parallel operation and one shore connection (SC) or shaft generator (SG) as illustrated above. The number of DGs can be extended to 16.

The main functions of the system are:

1. Engine start/stop
2. Synchronisation of generator breakers (GBs)
3. Synchronisation of shore connection breaker (SCB)/shaft generator breaker (SGB)

4. Load sharing between DGs
5. Generator protection
6. Busbar protection
7. Load-dependent start/stop
8. Priority handling
9. Heavy consumer (HC) control
10. Blackout detection and start of standby genset(s)
11. Short time paralleling between DGs and SG/SC
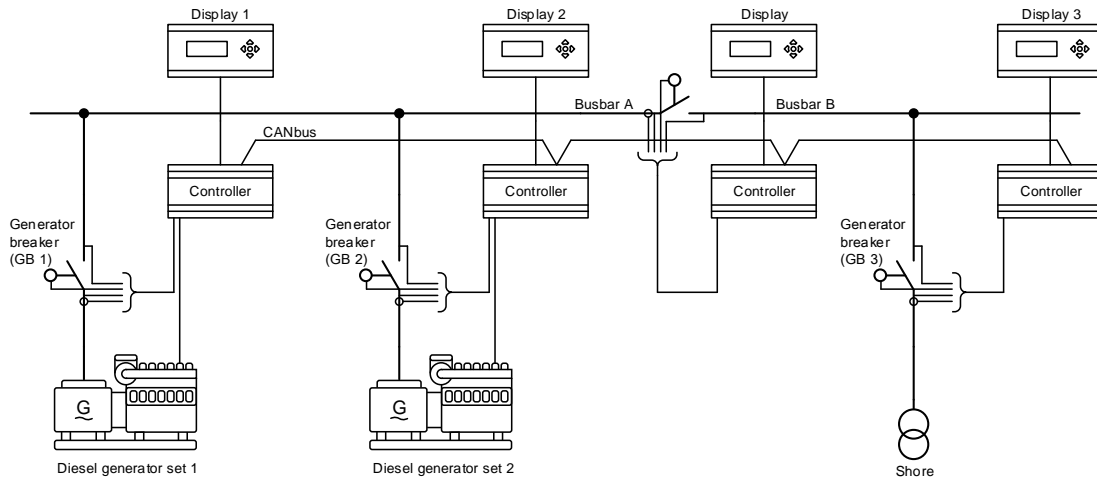12. Shaft/shore mode
13. DG mode

Required hardware
To support this application, the following hardware is required:

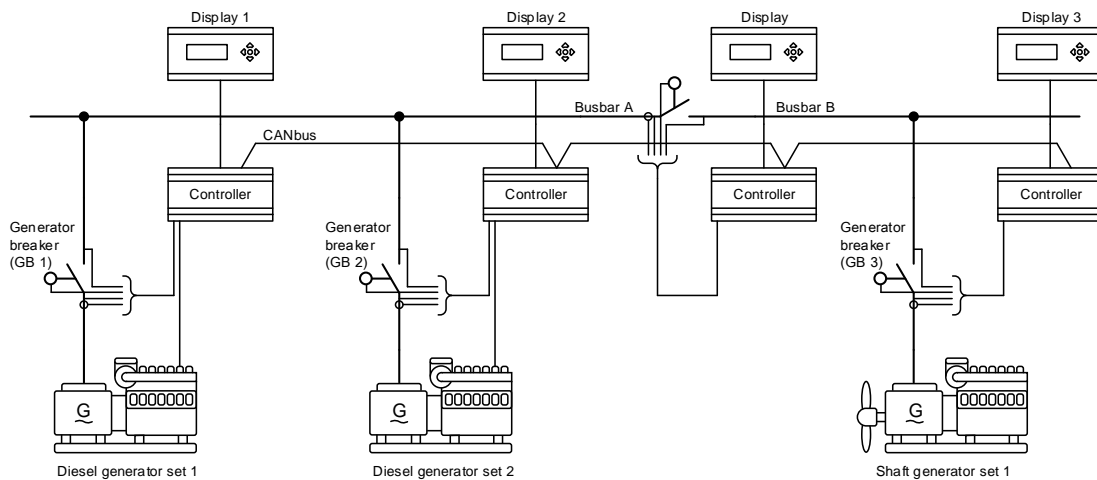2 × PPM-3 DG units (dependent on number of DGs)
1 × PPM-3 SG or SC unit

2.1.4 Application 3: 2 DGs, 1 SG/SC and 1 BTB
System overview
Application with shore connection (SC)

Application with shaft generator (SG)

By default, this application supports two diesel generators (DGs) in parallel operation, one bus tie breaker (BTB) and one shore connection (SC)/shaft generator (SG) as illustrated above. The number of DGs can be extended to 16.

The main functions of the system are:

1. Engine start/stop
2. Synchronisation of:
   ● generator breakers (GBs)
   ● shore connection breaker (SCB)/shaft generator breaker (SGB)
   ● bus tie breaker (BTB)

3. Load sharing
4. Generator protection
5. Busbar protection
6. Load-dependent start/stop
7. Priority handling
8. Heavy consumer (HC) control
9. Blackout detection and start of standby genset(s)
10. Short time paralleling between DGs and SG/SC
11. Plant modes:
    ● SHAFT/SHORE mode
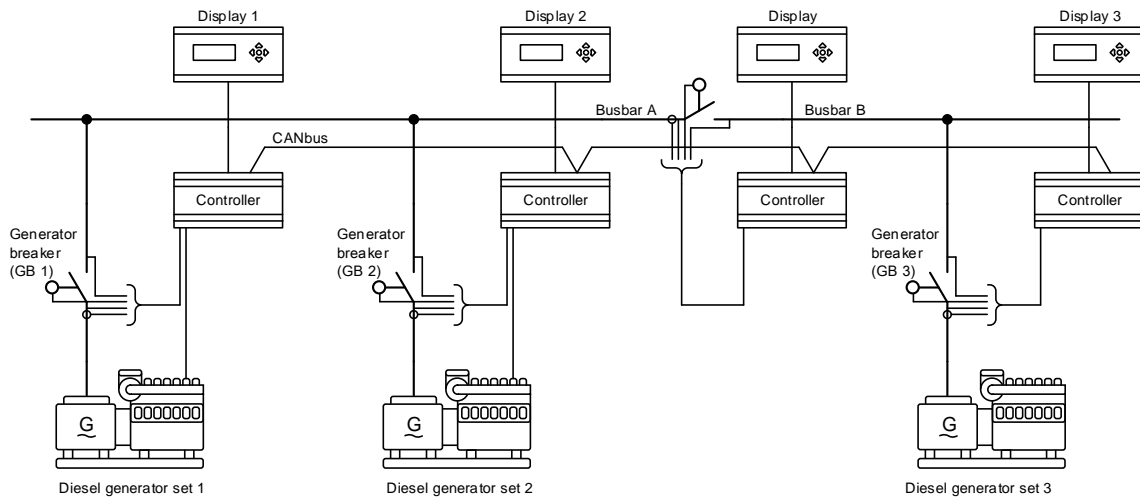   ● DG mode
    ● SPLIT mode

Required hardware
To support this application, the following hardware is required:

2 × PPM-3 DG units (dependent on number of DGs)
1 × PPM-3 SG or SC unit
1 × PPM-3 BTB unit

2.1.5 Application 4: 4 DGs and 1 BTB
System overview

By default, this application supports four diesel generators (DGs) in parallel operation and one bus tie breaker (BTB). The number of DGs can be extended to 16 and the number of BTBs to eight.

The main functions of the system are:

1. Engine start/stop
2. Synchronisation of:
   ● generator breakers (GBs)
   ● bus tie breaker (BTB)
3. Load sharing
4. Generator protection
5. Busbar protection
6. Load-dependent start/stop
7. Priority handling
8. Heavy consumer (HC) control
9. Blackout detection and start of standby genset(s)
10. Plant modes:
    ● DG mode
    ● SPLIT mode

Required hardware
To support this application, the following hardware is required:

4 × PPM-3 DG units
1 × PPM-3 BTB unit

2.2 Application verification

2.2.1 General
This chapter describes how to select/verify which application is active in the PPM-3 units. You can do this directly from the display or by using the PC utility software version 3 (USW 3), which you can download free of charge at www.deif.com.

(i) Refer to the documents Quick Start Guide and General Guidelines for Commissioning for further details on how to set up the PPM-3 units.

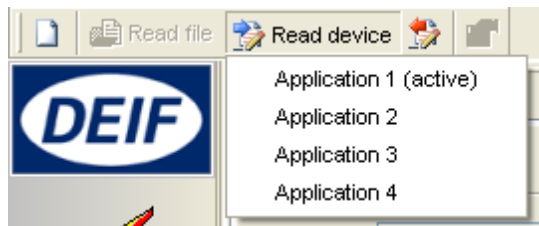### 2.2.2 Application verification with PC utility software

(i) Refer to the document Quick Start Guide for details on how to install the PC utility software (USW 3) and connect to the PPM-3 units.

1. Open the USW 3 and connect to any PPM-3 unit in the system.

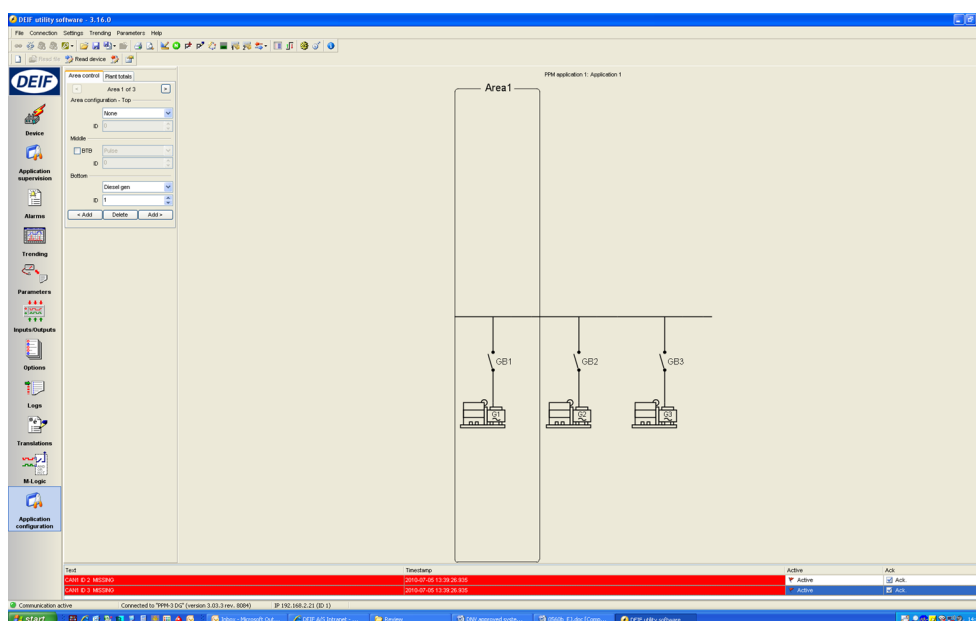2. Click the Application configuration tool.
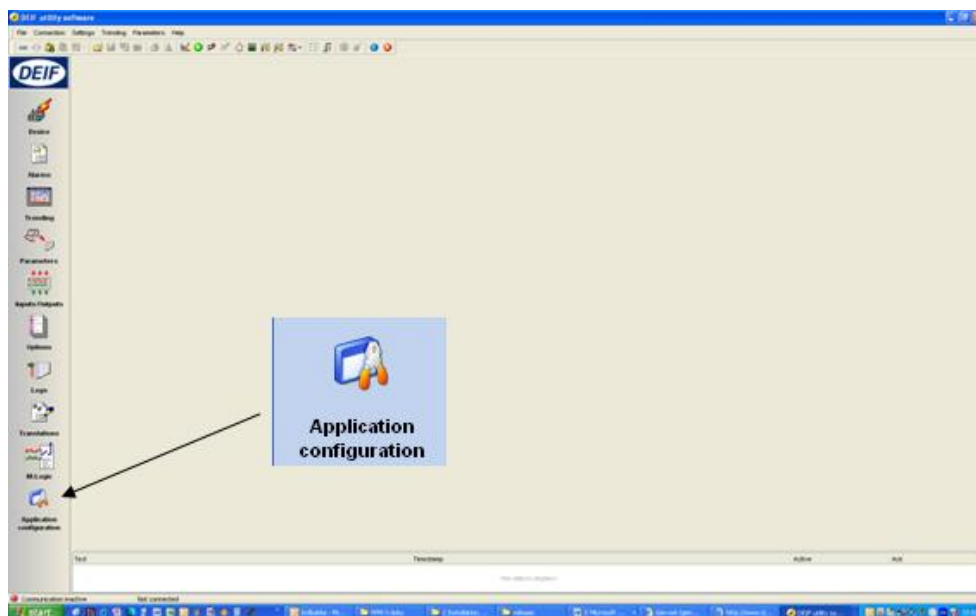
3. Select **Read device** to retrieve the application from the unit.

From the dropdown list you can see which application is active (default is application 1). When you select the active application, it will be read into the USW 3.

Screenshot from USW 3 after retrieving application 1:

In this case, the active application is application 1 configured with 3 × DGs.

2.2.3 Application verification with display

From the display of each PPM-3 unit you can select and check the active application in the jump menu 9160.

Check of active application

1. Press the JUMP button, use the up/down arrow buttons to go to menu 9160 and then press ENTER

2. Subsequently you can see the configuration of each application (A1, A2, A3 and A4). It is indicated in the lower right corner whether the application is active or inactive.

On the display above you can see:

1. that the application 1 (A1) configuration is 3 × DGs, 0 × SGs/SCs and 0 × BTBs
2. that application 1 is active (ACT)