DEIF A/S

Application note

Marine plant with shaft gen./shore conn. Multi-line 2 – version 2

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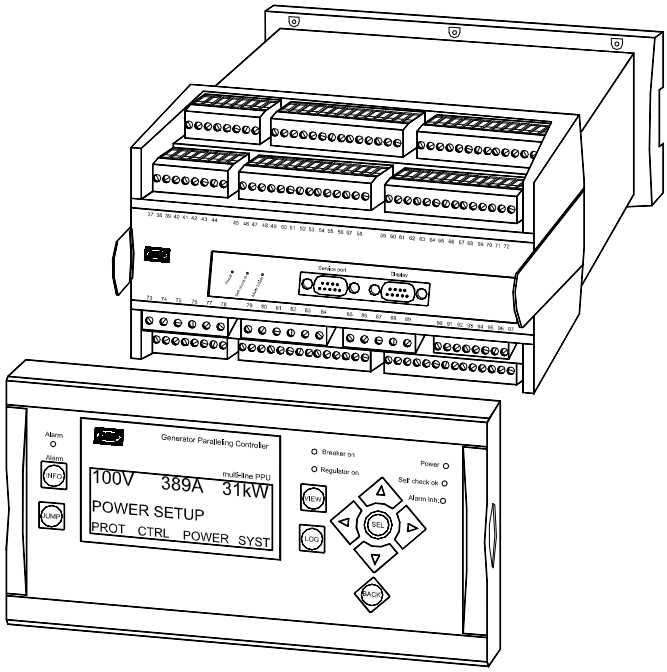

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Table of contents

These application notes refer to Multi-line 2 PPU version 2.20.0 or later.

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 and warnings, which will be used throughout this handbook, 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 generator set controlled by the unit, the company responsible for the installation or the operation of the set must be contacted.

The units are 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 unit implies 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.

Definitions

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

Notes

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

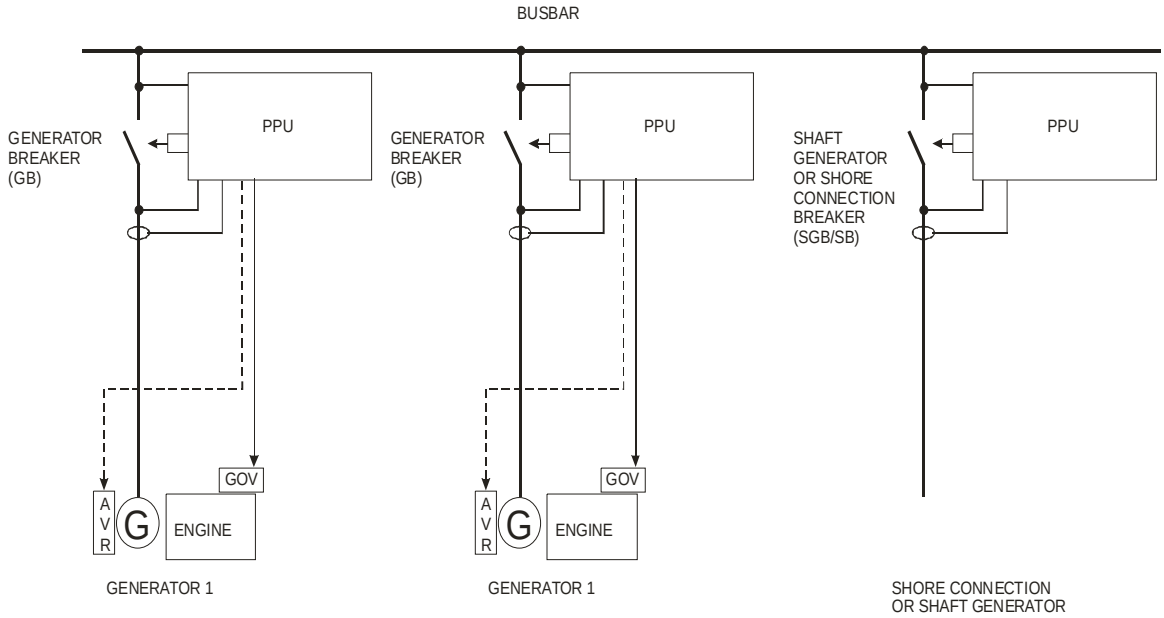
Warnings

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

2. Application description

System overview

This document describes the basic control system for a system controlling 2 (or more) diesel generators and one shore connection or a shaft generator. The system is made with the Multi-line 2 PPU controllers on the diesel generators and on the shaft generator.



Note that the drawing shows 2 generators, but the system can be used for any number of generators.

This application note describes how to make a system with the following functionality:

1. Start and stop engines
2. Synchronise generators and shaft/shore breakers
3. Automatic transfer from generator to shore/shaft
4. Automatic transfer from shore/shaft to generator

The system is one that can be operated manually, semi-automatically or automatically.

Start and stop engines

The PPU will control the start and stop of the engine. This is done automatically or controlled by the operator.

Synchronise generator and shore/shaft breakers

Synchronisation of the breakers is done automatically or it can be controlled by the operator.

Automatic transfer from generator to shore/shaft

In automatic mode the generator will automatically be stopped when the selector switch is switched to shore/shaft.

Automatic transfer from shaft/shore to generator

In automatic mode the generators will automatic be started when the selector switch is switched to generator.

Needed options

The PPUs must be equipped with the following options in order to carry out the controls and protection described in this application note:

For the PPU carrying out shaft generator/shore connection control:

- Option E1 to make analogue command setpoints for speed, power, voltage and power factor to the generator PPU units

For the generator PPUs:

- Option M1 or M2 to carry out engine start/stop and protection

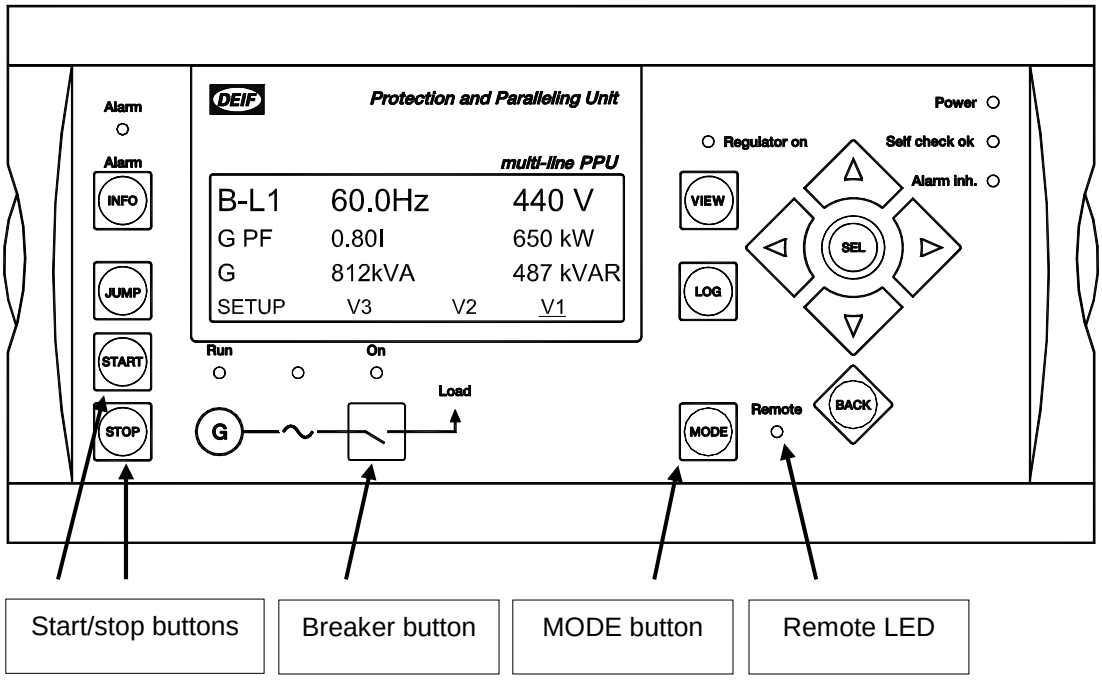
All other available options can be applied as requested. Attention must be paid to governor (AVR) interface and required protections.

Please refer to the data sheet for specific information about the possible options selection.

3. Functional description

Display

The display of the PPU used in this application looks like this:



The 'Remote' LED is indicating if the generator is controlled locally via the display unit push-buttons (LED = OFF) or remotely (LED = ON).

The selection is made on the 'Mode' button.

Selector switches

On the switchboard, a number of selector switches must be installed. The purpose is to be able to operate the system with the functionality mentioned in chapter 2.

Function / **Switch**	**Switch functionality**
Running mode selector	Selection between diesel generator or shaft/shore supply
Gen. auto/manual	Allows DG to be operated in AUTO mode
Gen. start enable	Enables the gen-set to start

Running mode selections

The operation of the gen-sets depends on the selected running mode. The running mode is selected with a selector switch and on the display.

AUTOMATIC

Set switch AUT/MAN on each generator switchboard to position AUTO
Set switch AUT/MAN on the shaft/shore switchboard to position AUTO
Set display mode in REMOTE

The Remote LED on the display must be ON.

This will enable the automatic generator running, meaning the generators will run constantly when the selector is in the “DIESEL” position.

SEMI-AUTOMATIC

Set switch AUT/MAN on each generator switchboard to position AUTO
Set switch AUT/MAN on the shaft/shore switchboard to position AUTO
Set display mode in LOCAL

The Remote LED on the display must be OFF.

The generators can now be started and stopped and the breaker closed (synchronised) and opened (ramp down first) using the display buttons.

MANUAL

Set switch AUT/MAN on each generator switchboard to position MANUAL
Set switch AUT/MAN on the shaft/shore switchboard to position MANUAL
Set display mode in LOCAL

The Remote LED on the display must be OFF.

Manual mode will enable the operator to use the START, STOP and Generator breaker buttons on the display for start/stop and generator breaker synchronising/open.

REMEMBER:

Set the mode on the display back to remote (LED ON) and ‘Generator AUT/MAN’ back in AUTO again when finished with manual operation. If this is not done, the result is that the generator will not participate in the automatic functions.

Manual speed control

In manual running mode, to adjust the speed (frequency) up and down, binary command inputs must be used.

- Input terminal 44: Raise speed
- Input terminal 45: Lower speed

Breaker operation

If the breaker is open, pressing the breaker button will make the PPU act as a check synchroniser (it will close the breaker when the conditions are OK), but the speed must be controlled with the binary inputs (or by other means).

If the breaker is in closed position and the breaker button is pressed, the breaker will open immediately in the manual running mode.

4. Wiring

Plant control wiring

Abbreviations used

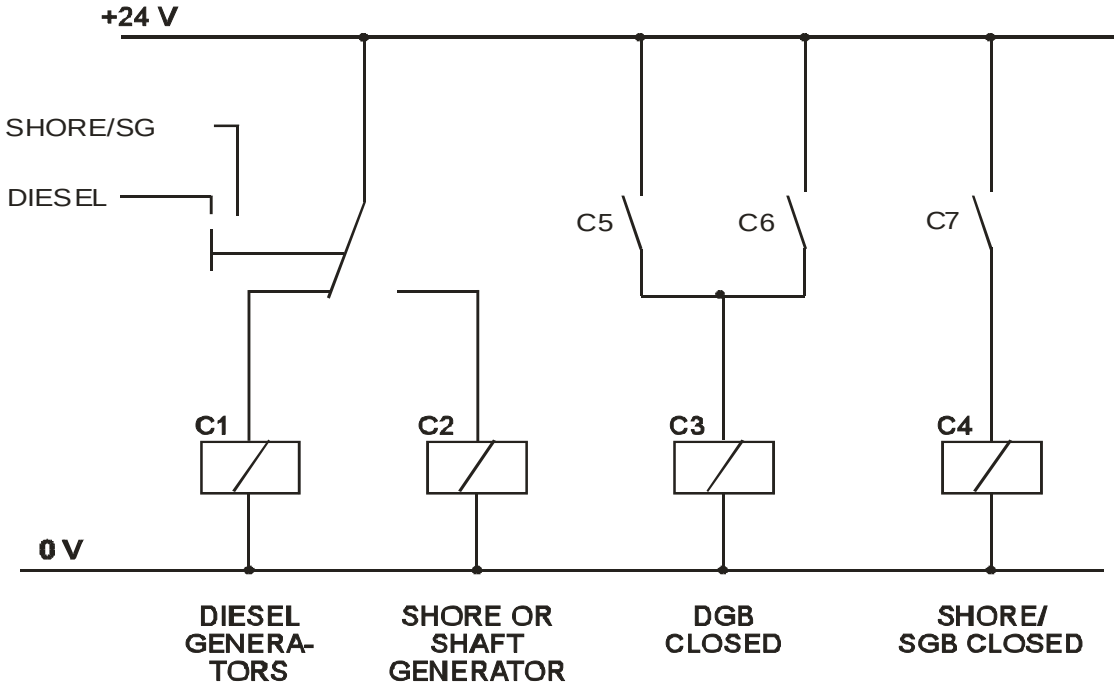
DG: Diesel generator
Shore: Shore connection
GB: Generator breaker
SG: Shaft generator
SGB: Shaft generator breaker/shore connection breaker

These wirings only comprise the DC lines. The AC lines are described in the PPU Designer's Reference Handbook.

DC controls

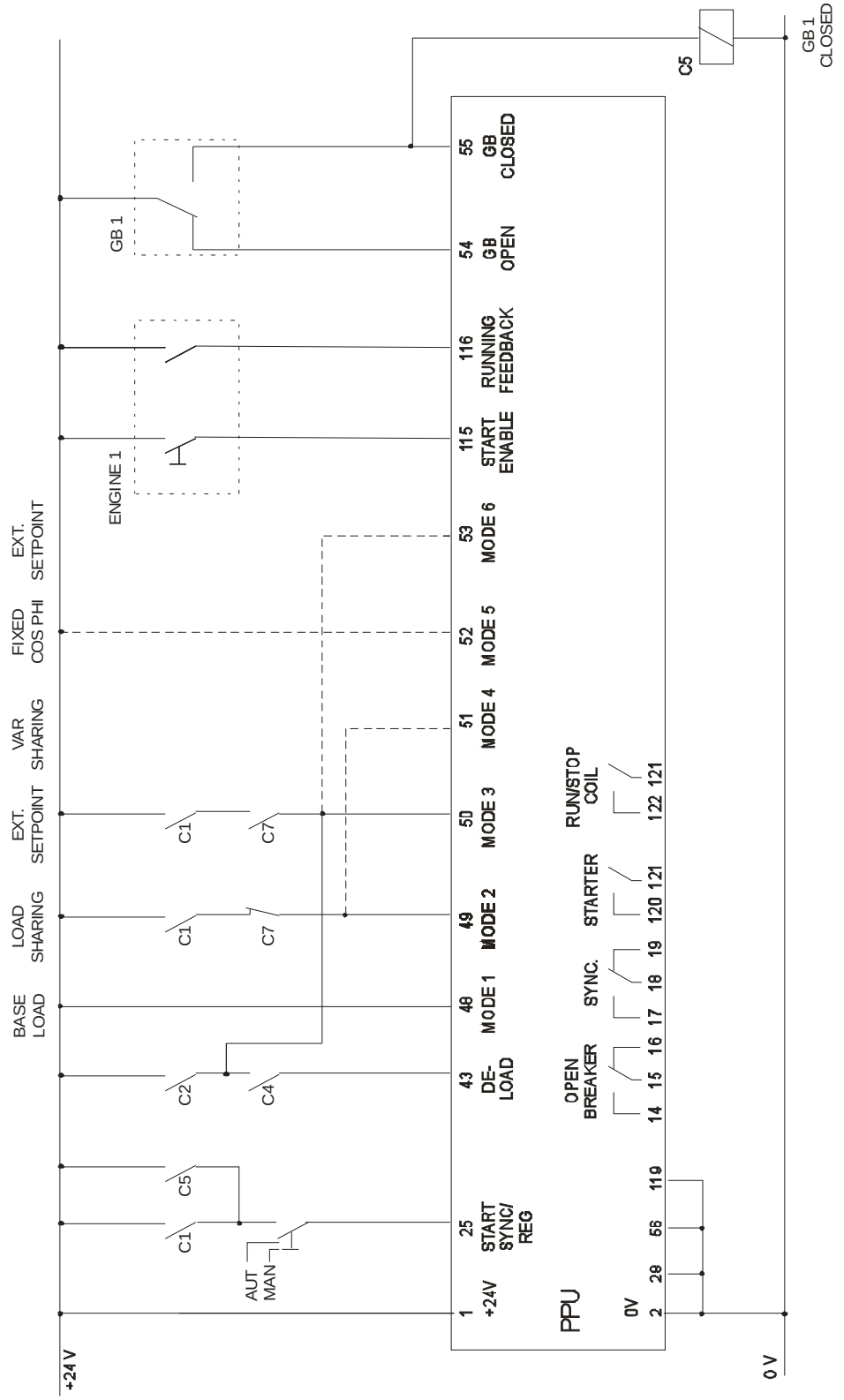
The wiring shows the necessary control circuits to carry out the task. It is assumed that all controls (except breaker commands) are carried out using 24V DC.

Running mode selector switch



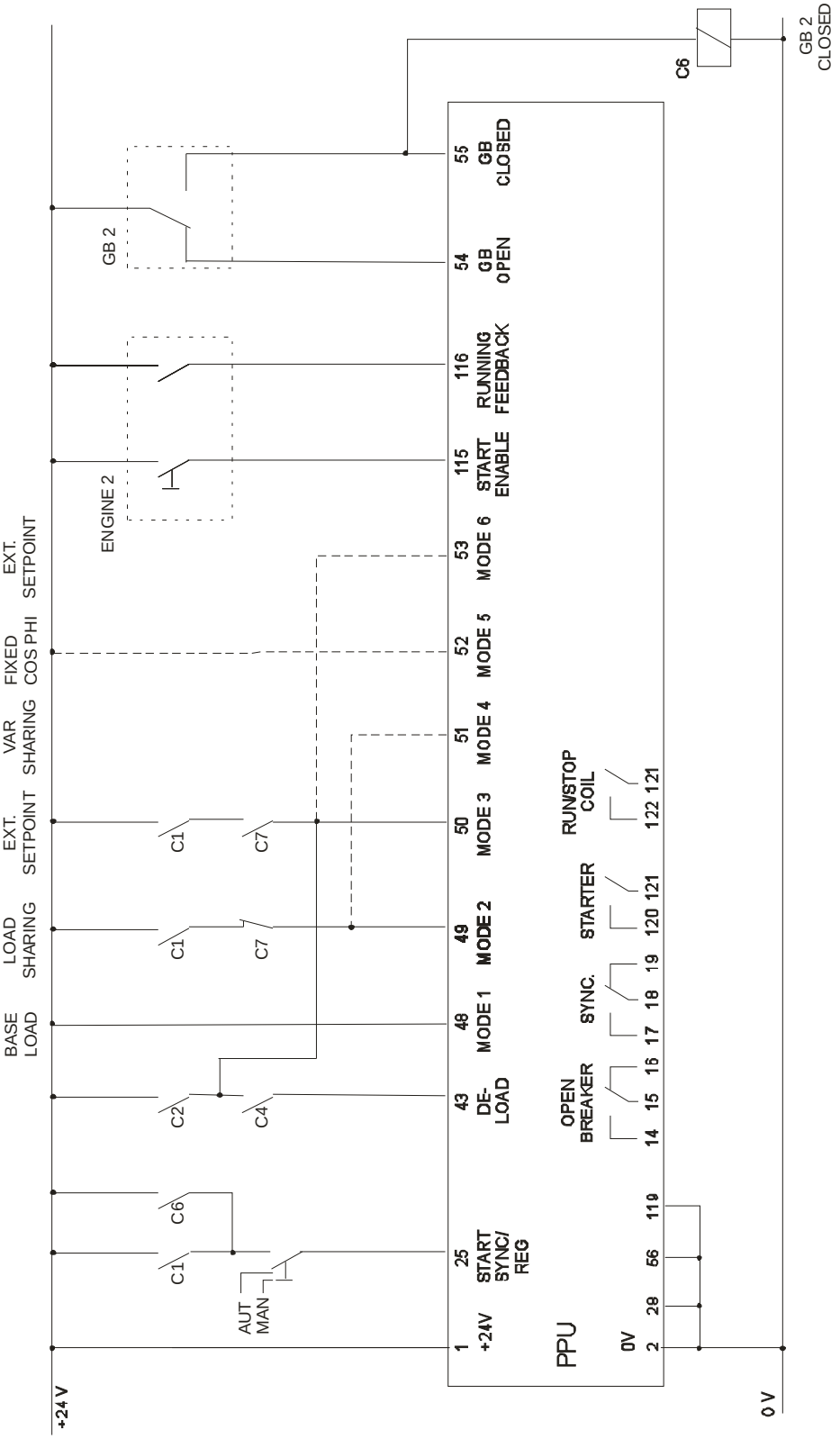
The selector switch is the operator's selector for diesel generator running or shore connection/shaft generator connection. Note that for the switching to take effect, the PPUs must be in "remote" mode (selected on the display).

DG1 PPU control



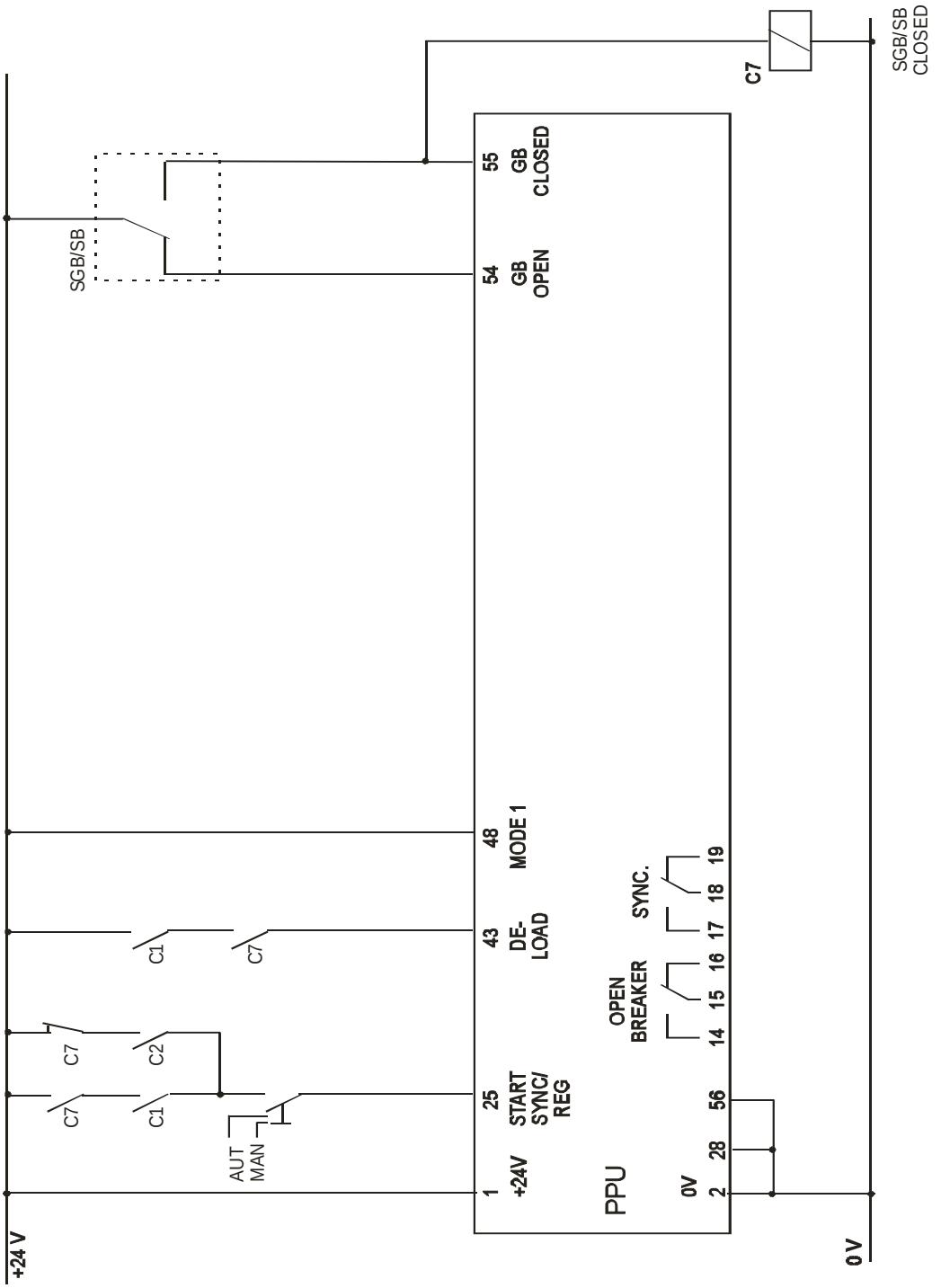
The dotted line connections are only needed if AVR control is included.

DG 2 PPU controls

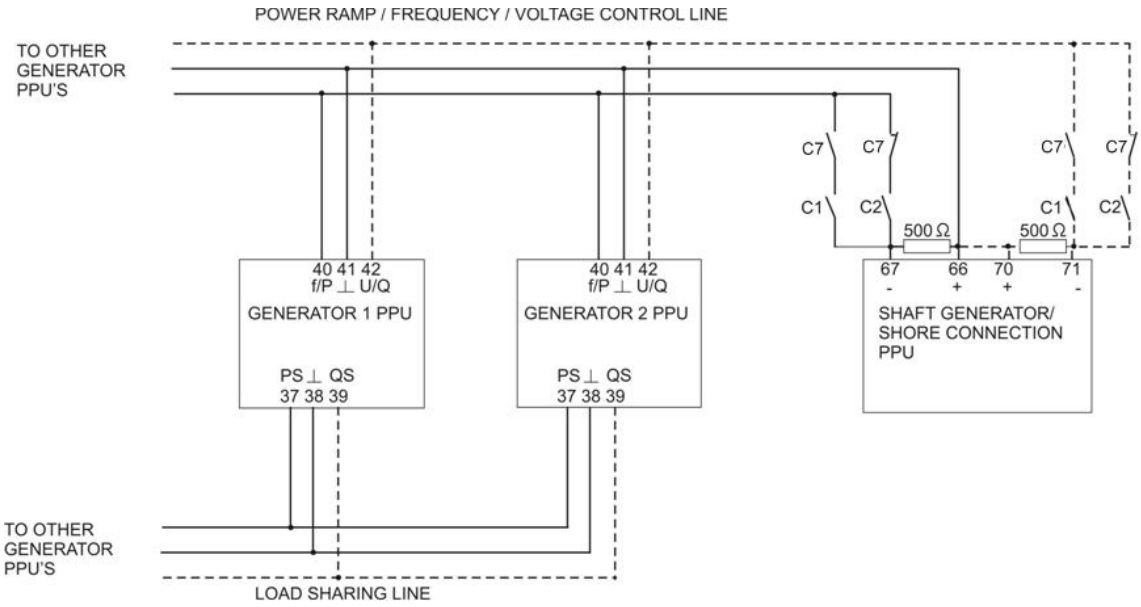


The dotted line connections are only needed if AVR control is included.

SG/SHORE PPU controls



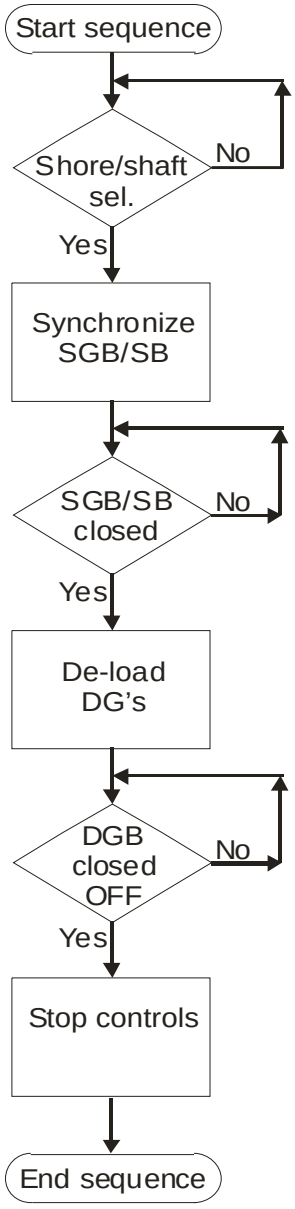
DC analogue lines between units



The dotted line connections are only needed if AVR control is included.

5. Flowcharts

Transfer to shaft generator/shore supply



Transfer to diesel generator supply