



## **LS-5 Series LS-511/521 Marine Circuit Breaker Synchronization & Control**

### **DESCRIPTION**

The LS-511/521 Marine is designed to enable complex power management applications with multiple segments and bus breakers in combination with easYgen™-3400/3500 equipped genset controllers. The LS-5 devices manage synchronization, loading and unloading on each bus segment, and send the required voltage and frequency references via CAN bus to the easYgen-3400/3500 genset controllers. Wiring efforts are reduced to a minimum, since only one CAN bus connection is required between all LS-5 and easYgen-3400/3500 controllers. It is not required to wire any AC measurement signals or discrete inputs/outputs between the LS-5 and easYgen controllers. The LS-5 can also be used as a sync-check relay in stand-alone mode without easYgens. Equipped with redundant monitoring of circuit breaker, LS-5 Marine controllers together with easYgen-3400/3500 Marine controllers enable you to command from simple to the most complex electrical power systems in your marine application.

### **FEATURES**

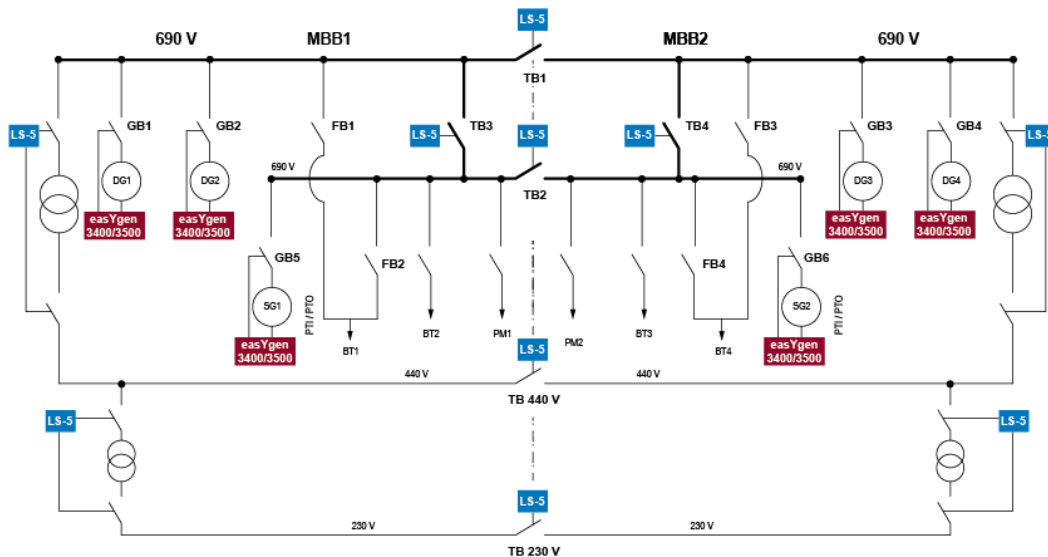
- Provides full connectivity to Woodward's easYgen-3400/3500 Marine genset controllers to enable complex power control applications with multiple segments and bus tie breakers. 16 LS-5 units can be used in total in combination with up to 32 easYgen-3400/3500 in one application
  - Phase match or slip frequency synchronization with voltage matching
  - Segment control for the load sharing
  - Full remote control via CAN or RS-485 interface
  - Breaker open/close failure detection
  - Configurable breaker reclose timer
  - 8 Freely configurable LED's in back panel variant for easy trouble shooting
  - In case transformers are used in the application, vector group adjustment is available
  - Automatic date and time synchronization between the LS-5 units and the connected easYgen-3400/3500 controls
  - Event Log with up to 300 entries
  - Automatic and Manual mode
  - LS-5 "Stand alone" mode without the easYgen-3400/3500 is possible
  - Multilingual HMI (11 languages and more)
  - Lock Keypad feature
- Solution for complex power control applications in conjunction with Woodward easYgen-3400/3500 Marine controllers
  - Up to 16 LS-5 units can be utilized in one application
  - Up to 32 bus segments are possible
  - Synchronizer and Sync check functions
  - Automatic segment control
  - Supports manual breaker closing
  - Configurable breaker reclose timer
  - CAN and RS-485 interfaces for remote control and visualization purposes
  - True RMS sensing
  - Available as cabinet front door mounted device or DIN-Rail backpanel mounted metal housing
  - Freely configurable relay outputs
  - Freely configurable discrete inputs
  - Multilingual HMI
  - DNV, GL, BV, ABS, and LR marine approved
  - Event logger

# SPECIFICATIONS

Power supply..... 12/24 Vdc (8 to 40 Vdc)  
 Intrinsic consumption ..... max.~ 5 W (LS-511)  
 ..... max.~ 6 W (LS-521)  
 Ambient temperature (operation).....-20 to 70 °C / -4 to 158 °F  
 Ambient temperature (storage).....-30 to 85 °C / -22 to 185 °F  
 Ambient humidity.....95 %, non-condensing  
**Voltage** ..... (  $\Delta$ / $\Delta$ )  
 120 Vac [1] Rated ( $V_{rated}$ ).....69/120 Vac  
 Max. value ( $V_{max}$ ).....86/150 Vac  
 Rated voltage phase – ground .....150 Vac  
 Surge volt. ( $V_{surge}$ ).....2.5 kV  
**and 480 Vac [4]** Rated ( $V_{rated}$ ).....277/480 Vac  
 Max. value ( $V_{max}$ ).....346/600 Vac  
 Rated voltage phase – ground .....300 Vac  
 Surge volt. ( $V_{surge}$ ).....4.0 kV  
 Accuracy .....Class 1  
 Linear measuring range .....1.25 $\times V_{rated}$   
 Measuring frequency.....50/60 Hz (40 to 85 Hz)  
 High Impedance Input; Resistance per path.....[1] 0.498 M $\Omega$ , [4] 2.0 M $\Omega$   
 Max. power consumption per path.....< 0.15 W  
**Current (Isolated)** Rated ( $I_{rated}$ ).....[1] ..1 A or [5] ..1/5 A  
 Linear measuring range ..... $I_{gen} = 1.5 \times I_{rated}$   
 Burden.....< 0.15 VA  
 Rated short-time current (1 s).....[1] 50 $\times I_{rated}$ , [5] 10 $\times I_{rated}$   
**Discrete inputs** .....isolated  
 Input range .....12/24 Vdc (8 to 40 Vdc)  
 Input resistance.....approx. 20 kOhms

**Relay outputs** .....potential free  
 Contact material.....AgCdO  
 Load (GP) .....2.00 Aac@250 Vac  
 .....2.00 Adc@24 Vdc / 0.36 Adc@125 Vdc / 0.18 Adc@250 Vdc  
 Pilot duty (PD).....  
 .....1.00 Adc@24 Vdc / 0.22 Adc@125 Vdc / 0.10 Adc@250 Vdc  
**Housing (LS-521)** Front door mounting.....Plastic housing  
 Dimensions WxHxD .....219 x 171 x 61 mm  
 Front cutout WxH .....186 [+1.1] x 138 [+1.0] mm  
 Connection.....screw/plug terminals 2.5 mm<sup>2</sup>  
 Front.....insulating surface  
 Sealing Front.....IP65 (with screw fastening)  
 Front.....IP54 (with clamp fastening)  
 Back .....IP20  
 Weight.....approx. 850 g  
**Housing (LS-511)** Back panel mounting.....Sheet metal housing  
 Dimensions WxHxD .....190 x 167 x 47 mm  
 Connection.....screw/plug terminals 2.5 mm<sup>2</sup>  
 Protection system .....IP 20  
 Weight.....approx. 840 g  
**Disturbance test (CE)** .....tested according to applicable EN guidelines  
**Listings** .....UL/cUL, GOST-R  
**Marine** .....LR (Type Approval), ABS (Type Approval), DNV, GL, BV

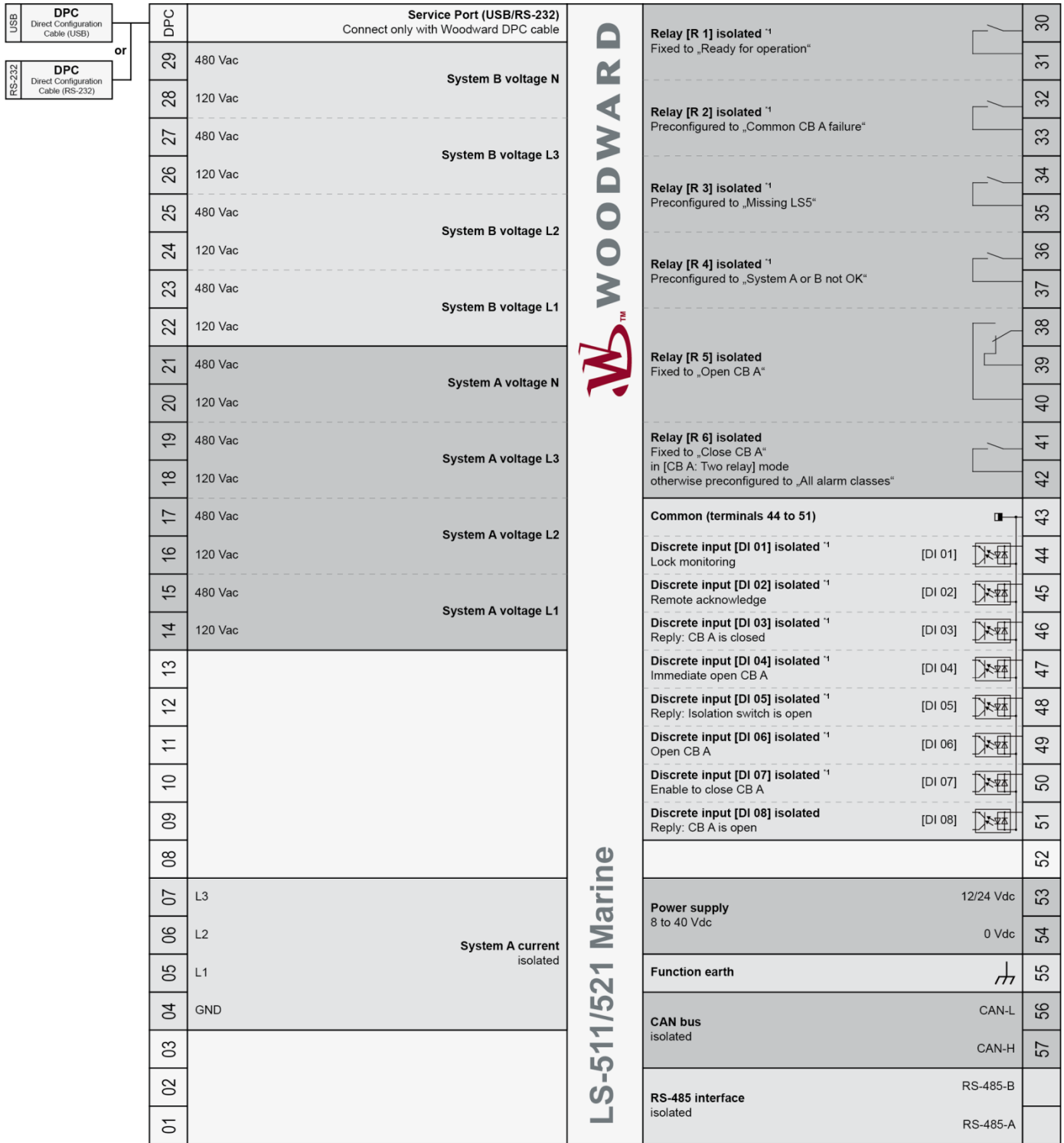
# APPLICATION



## Description

- This complex system taken from a real application ensures that one power source failure does not lead to total loss of the network.
- This application can be implemented with LS-5 circuit breaker control modules in conjunction with easYgen gset controllers and remote panels (if need be).
- The easYgens guide the generator and serve the generator circuit breaker while LS-5 units control feeder or tie-breakers. The remote panel connected to the easYgens helps remote visualization, control, and troubleshooting.
- The modules may serve the PMS by providing the relevant data (e.g. breaker status, alarms, measurements, bus bar status, engine status, and much more).
- Modules communicate individually through CAN. And they provide CAN/RS485/RS232 communication interfaces for the PMS system. The PMS fulfills the supervisory function; monitoring, control and protection functions are fulfilled by easYgen and LS-5 modules.
- The easYgen and LS-5 system is easily configurable and does not require any expert intervention.

# TERMINAL DIAGRAM



**WOODWARD**

**LS-511/521 Marine**

Subject to technical modifications.

\*\* = configurable via LogicsManager

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The related manual  
 37542

# FEATURES OVERVIEW

	LS-511 Marine	LS-521 Marine
<b>I/Os</b>		
Display	No	Yes
Configurable LEDs on Faceplate	Yes	No
System A/B voltage measurement	3-Phases + Neutral	3-Phases + Neutral
System A current measurement	3-Phase	3-Phase
Discrete inputs	8	8
Relay outputs	6	6
CAN Interface	1	1
RS-485 Interface	1	1
<b>Control</b>		
Automatic and Manual operating modes	✓	✓
Breaker synchronization (slip synchronization / phase matching)	✓	✓
Vector group adjustment for synchronization	✓	✓
Configurable dead bus closure direction	✓	✓
<b>HMI</b>		
Configuration via HMI and PC	PC only	✓
Event recorder with real time clock (battery backup)	✓	✓
Date and Time Synchronization between (all types of) LS-5s and easYgen-3000's	✓	✓
<b>Protection</b>		
Over-/undervoltage (59/27) System A	✓	✓
Over-/underfrequency (81O/U) System A	✓	✓
Voltage asymmetry (47) System A	✓	✓
Phase shift (78) System A	✓	✓
df/dt (ROCOF) (81) System A	✓	✓
Time-dependent voltage System A	✓	✓
<b>Monitoring</b>		
Breaker open/close monitoring	✓	✓
Synchronization time out monitoring	✓	✓
<b>Counter</b>		
Circuit breaker closure counter	✓	✓
<b>Part Numbers</b>		
LS-511 (1A / 5A)	Cabinet back mounting 8440-2076 / 8440-2077	Front panel mounting ---
LS-521 (1A / 5A)	---	8440-2074 / 8440-2075
DIN-Rail mounting Kit for LS-511	8923-1746	---
DPC-RS-232 direct configuration cable		5417-557
DPC-USB direct configuration cable		5417-1251

# APPROVALS

