



DSL-2™ Digital Synchronizer and Load Control

DESCRIPTION

Woodward's DSLC-2 synchronizes and controls the generator loading for up to 32 three phase AC generators using the integrated (DSL-2/MSLC-2) Ethernet communication network. The DSLC-2 excels in either simple generator or complex generator system applications. The DSLC-2/MSLC-2 combination provides multiple unit, segment, utility and intertie power management for complex power systems.

The DSLC-2 control combines synchronizer, load sensor, load control, dead bus closing system, VAR, power factor and process control, all integrated into one powerful package. Applications allow up to 32 generators to be precisely paralleled and controlled. Ethernet network A provides dead bus closing, load sharing, and VAR sharing information between DSLC-2 and MSLC-2 units. Ethernet port B provides customer remote control and monitoring capability using Modbus TCP allowing easy DCS and PLC interfacing. The Ethernet network provides each device the capability to monitor all other devices on the network. If the Ethernet network is compromised, an alarm is provided and the system can be transferred to a droop control mode.

Redundant load sharing is selectable using both Ethernet A and B networks for improved reliability. If one network is compromised, the system automatically switches to the second network.

Slip frequency or phase matching automatic synchronizing with or without dead bus closing is selectable. Permissive mode provides synch check relay functionality.

The DSLC-2 control senses true RMS power and provides soft bump-less loading and unloading functions. It can either base load or set import/export/process power levels against the utility, or accurately share loads on isolated, multiple generator systems.

VAR and power factor control flexibility allows you to either provide a set level of VARs to the utility or to maintain a constant power factor for reliable operation. The VAR/PF control also shares kVARs in an isolated system, maintaining proportional reactive loads (kVARs) on all machines more accurately than droop or cross-current voltage systems.

FEATURES

- Dedicated Ethernet network for precise system communications between all DSLC-2's and MSLC-2's reduces system wiring.
 - Ethernet Modbus TCP, and Modbus RTU, for remote control and monitoring.
 - Redundant Ethernet communication for enhanced reliability.
 - The "system update" feature allows for removing or adding generator sets.
 - The new DSLC-2 can be configured for multiple applications.
 - Integrated DSLC-2 and MSLC-2 system functionality eliminates the need for redundant sensors (like PTs, CTs, and MOPs) that connect to individual modules such as the load sensors and synchronizers.
 - Back panel mounting and a reduced size frees up door space and provides easy wiring.
 - Eliminates the need for additional relay logic to control dead bus closing.
 - Slip frequency paralleling, voltage matching, and speed bias transfer between the synchronizer and load control result in smooth paralleling without the risk of reverse power trips.
 - Three-phase true RMS power sensing makes the DSLC-2 control accurate even with unbalanced phase loading and voltage fluctuations.
 - Phase angle correction for GCB when a transformer is included in the system.
 - The Woodward ToolKit™ software allows flexible setup using the same basic menu tree as the original DSLC plus an overview screen. Graphical overview of generator and bus bar parameters with trending makes the DSLC-2 commissioning friendly. All the Woodward devices can be programmed from a single connection to the network.
 - The ToolKit can be accessed either via one of the Ethernet ports or via RS-232 port.
- Applications for up to 32 generators with 16 mains/tie breakers
 - Complex applications with up to 8 bus segments
 - Redundant load and VAR sharing over Ethernet
 - Four communication ports:
2 Ethernet, RS-485 & RS-232 ports.
 - The "system update" feature allows for removing or adding generator sets in the system.
 - Automatic generator soft loading and unloading for bump-less load transfer
 - Isochronous load sharing with other DSLC-2 equipped sets
 - Base load and process control modes
 - VAR or Power Factor control
 - Dead bus closing
 - PLC & DCS compatible
 - The DSLC-2 hardware is configurable for multiple speed controls, voltage regulators, and potential transformer configurations
 - Application range up to 999,999.9 MW
 - UL/cUL & CE Listed

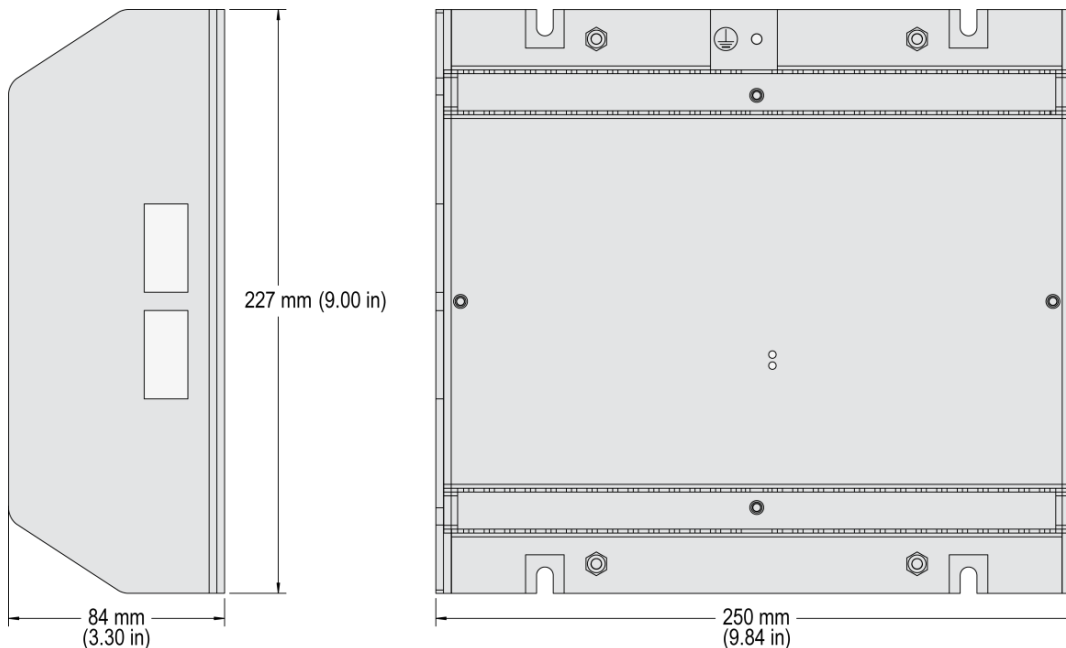
SPECIFICATIONS

| | |
|---|---|
| Power supply | 12/24 Vdc (8 to 40 Vdc) |
| Intrinsic consumption | max. 15 W |
| Ambient temperature (operation) | -40°C to 70°C / -40 to 158°F |
| Ambient temperature (storage) | -40°C to 85°C / -40 to 185°F |
| Ambient humidity | 95%, non-condensing |
| Voltage | (Δ) |
| 120 Vac [1] | Rated (V_{rated}) 69/120 Vac |
| | Max. value (V_{max}) 86/150 Vac |
| | Rated voltage phase - ground 150 Vac |
| | Rated 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 |
| | Rated surge volt. (V_{surge}) 4.0 kV |
| Accuracy | Class 0.5 |
| Measurable alternator windings | 3p-3w, 3p-4w, 3p-4w OD |
| Setting range | primary 50 to 650,000 Vac |
| 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 Ω , [4] 2.0 M Ω |
| Max. power consumption per path | < 0.15 W |
| Current (galvanically isolated) Rated (I_{rated}) | [1] ..1 A or [5] ..1/5 A |
| Linear measuring range | $I_{gen} = 3.0 \times I_{rated}$ |
| | $I_{mains/ground} = 1.5 \times I_{rated}$ |
| Setting range | 1 to 32,000 A |
| Burden | < 0.15 VA |
| Rated short-time current (1 s) | [1] 50 $\times I_{rated}$, [5] 10 $\times I_{rated}$ |
| Accuracy | Class 0.5 |

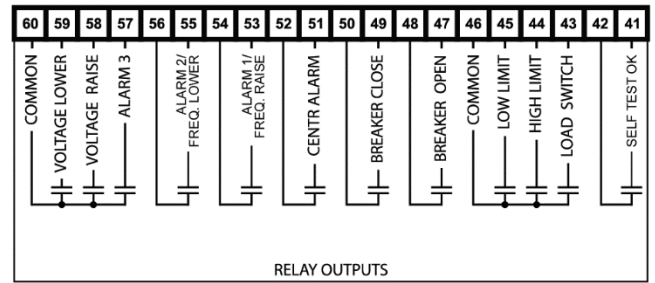
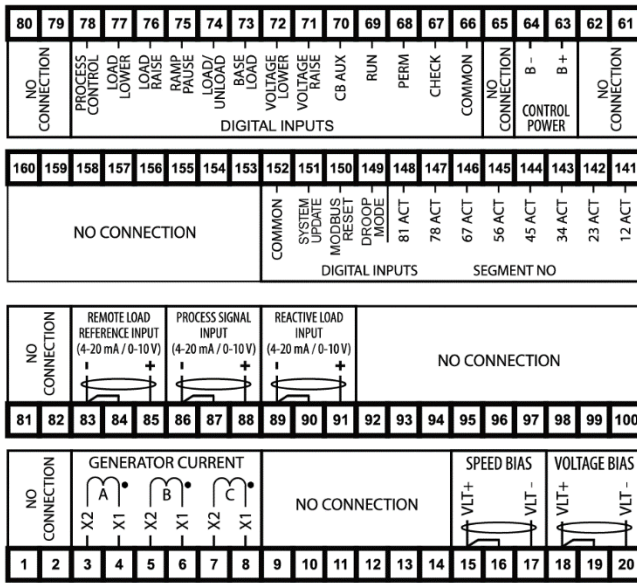
| | |
|---|---|
| Power | Setting range 0.5 to 999,999.9 MW/kvar |
| Discrete inputs | galvanically isolated |
| Input range | 12/24 Vdc (8 to 40 Vdc) |
| Input resistance | approx. 20 kOhms |
| Relay outputs | galvanically isolated / potential free |
| Contact material | AgCdO |
| Load (GP) | 2.00 Aac@250 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 |
| Analog inputs (not isolated) | freely scalable |
| Type | 0 to 10 V / 0 to 20 mA |
| Resolution | 11 bits |
| Analog outputs (galvanically isolated) | freely scalable |
| Type | ± 10 V / ± 20 mA / PWM |
| Insulation voltage (continuously) | 100 Vac |
| Insulation test voltage (1s) | 500 Vac |
| Resolution | 11/12 Bit (depending on analog output) |
| ± 10 V (scalable) | internal resistance approx. 500 Ohms |
| ± 20 mA (scalable) | maximum load 500 Ohms |
| Housing | Powder coated aluminum for back panel mounting |
| Dimensions | WxHxD 250 \times 227 \times 84 mm (9.84 \times 9.00 \times 3.30 in) |
| Connection | screw/plug terminals 2.5 mm ² |
| Protection system | IP 20 |
| Weight | approx. 1,900 g (4.2 lbs.) |
| Disturbance test (CE) | tested according to applicable EN guidelines |
| Listings | UL, cUL, GOST-R, CSA |
| Marine | LR (Type Approval), ABS (Type Approval) |

DIMENSIONS

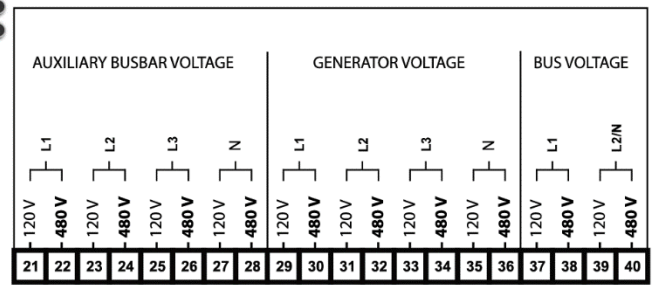
Powder coated aluminum housing for cabinet mounting



TERMINAL DIAGRAM

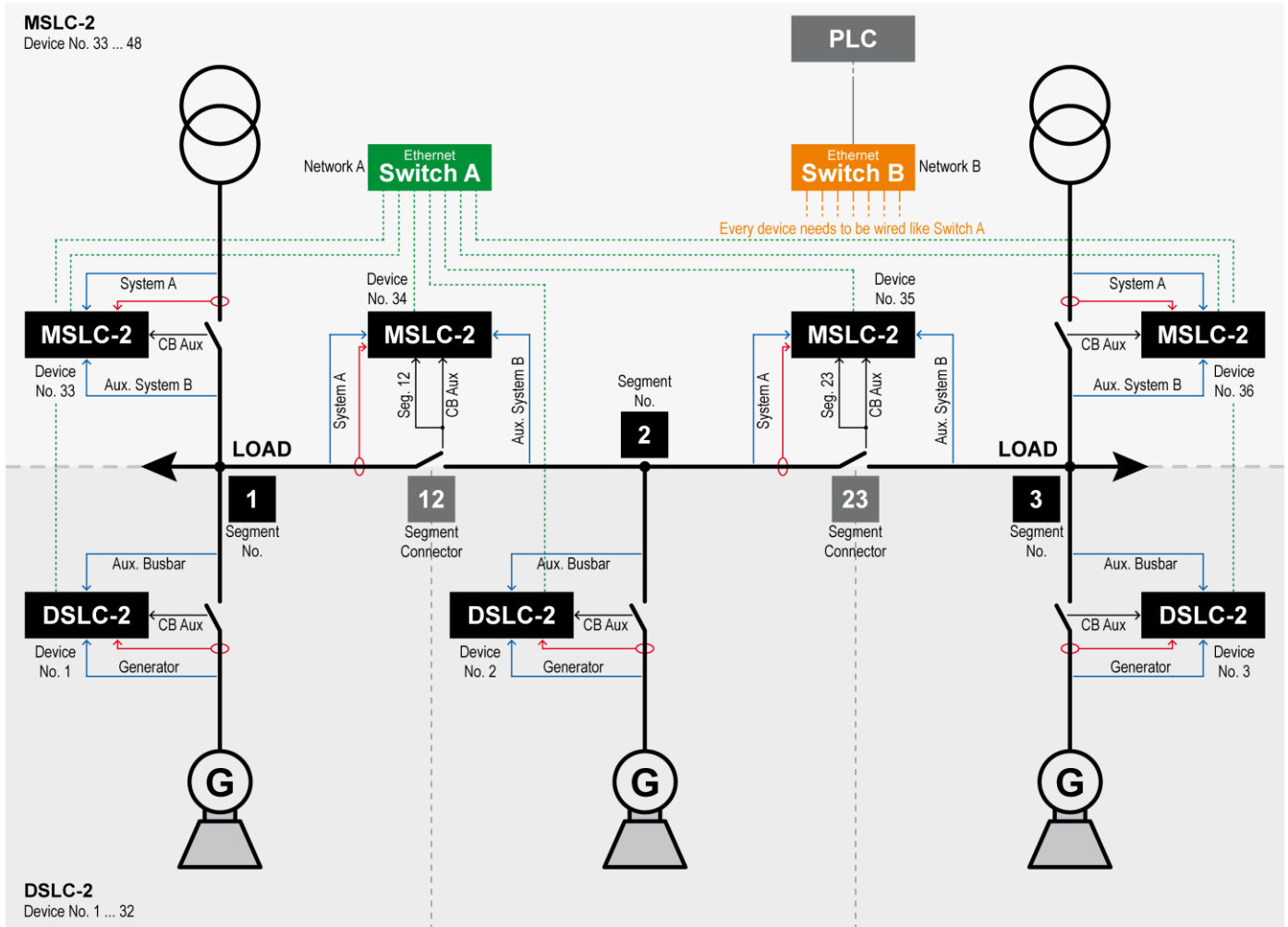


CPU OK
SYNC
ENABLE



DSLС-2 – Terminal diagram

TYPICAL CONFIGURATION



Configuration of a typical application using DSLС-2 und MSLC-2™ devices in combination

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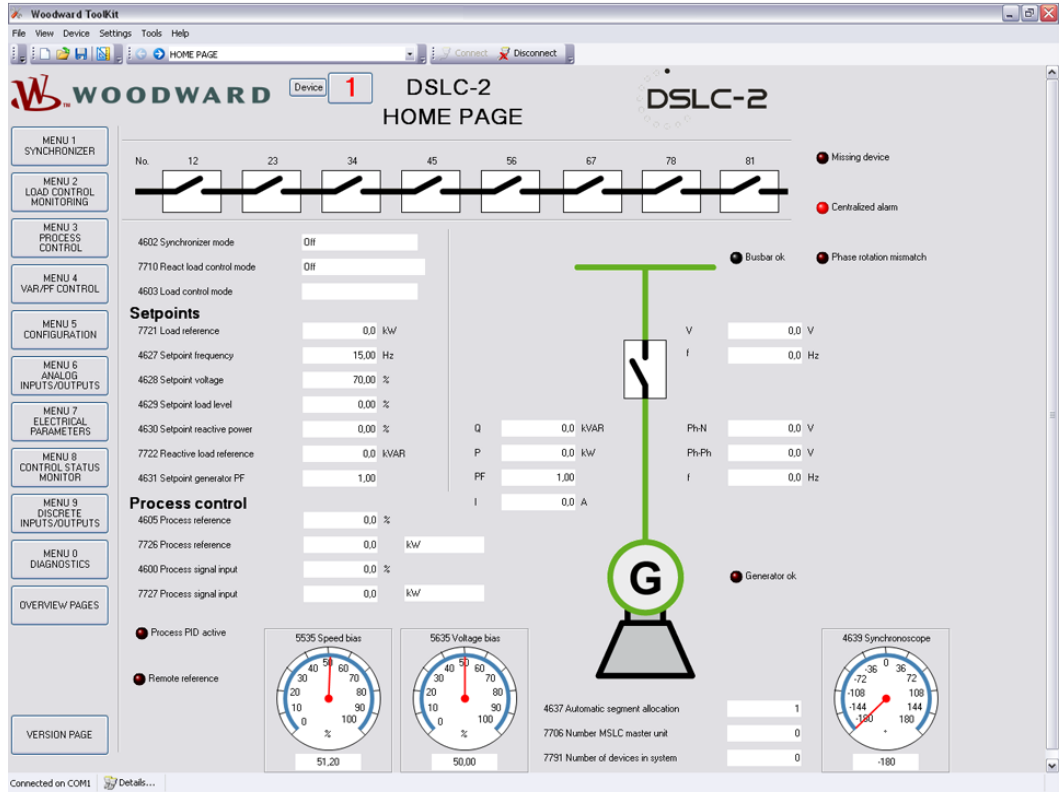
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TOOLKIT CONFIGURATION SOFTWARE

Woodward's ToolKit provides user friendly configuration, commissioning assistance, displays all operating modes, and the overview pages show what other controls the DSLC-2 is communicating with. The DSLC-2 Home Page is shown below.
Note: The menu tree illustrated on the left side is similar to the original DSLC™ structure.



FEATURES OVERVIEW

| | DSL-2 | MSLC-2 |
|-------------------------------------|--|--|
| I/Os | | |
| Discrete inputs | 23 | 23 |
| Relay outputs | 12 | 12 |
| Analog inputs | 3 | 3 |
| Analog outputs | 2 | - |
| RS-232 Interface | 1 | 1 |
| RS-485 Interface | 1 | 1 |
| Ethernet Interfaces (10/100 Mbit/s) | 2 | 2 |
| LED 1 "CPU OK" | Off / not ready / ready / system update active | Off / not ready / ready / system update active |
| LED 2 "Sync Enable" | Off / ready / not OK | Off / ready / not OK |
| Listings/Approvals | | |
| UL / cUL Listing | ✓ | ✓ |
| GOST-R & CSA | ✓ | ✓ |
| LR & ABS Marine | ✓ | ✓ |
| CE Marked | ✓ | ✓ |

PART NUMBERS

| DSL-2 | | MSLC-2 | |
|-------------------------------------|---------------|---------------|---------------|
| 1A CT inputs | 5A CT inputs | 1A CT inputs | 5A CT inputs |
| P/N 8440-1978 | P/N 8440-1878 | P/N 8440-1977 | P/N 8440-1877 |
| Accessories | | | |
| Spare connector kit - P/N 8923-1806 | | | |

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