



## MSLC-2™ Master Synchronizer and Load Control

### DESCRIPTION

Woodward's MSLC-2™ functions with the DSLC-2™ control to provide synchronization and load control across Utility and Intertie breakers. The MSLC-2/DSL-2 combination operates over an Ethernet communication network to control simple or complex generator system applications. This combination, 32 DSLC-2's and 16 MSLC-2's, provide multiple unit, multiple segment, utility and intertie power management for complex power systems. Controls plant wide Import / Export levels while always providing bump-less load transfers with utility.

The MSLC-2 control combines synchronization, dead bus closing, utility/intertie load sensor, base-load control, import/export control, VAR, power factor, and a master process control in one powerful package.

The MSLC-2 provides phase matching or slip frequency synchronization, with voltage matching, across a utility or intertie breaker. The MSLC-2/DSL-2 combination can handle multiple utility connections with a maximum of 8 bus segments in one application.

The MSLC-2's load sensor and load control sense true RMS power and provide a bump-less loading and unloading against a utility grid. Baseload, import/export, process, and utility unload modes control the KW power between different power sources at the same time controlling the reactive power, VAR and power factor. Reactive power is also ramped on and off for the smoothest load transactions between power grids.

The MSLC-2 communicates via Ethernet, with redundant Ethernet now available, to control real and reactive loading against the utility by DSLC-2 equipped generators.

The tie breaker mode allows synchronization between multiple generator systems. Segments are connected and power can be measured across an intertie, but no load control is functional when in Tie breaker operation.

### FEATURES

- One MSLC-2 can provide master control for up to 32 DSLC and an additional 15 MSLC-2 in a system.
- Two dedicated Ethernet lines for precise system communications between all DSLC-2's and MSLC-2's on the system.
- Ethernet Modbus TCP for remote control and monitoring by PLC or DCS system.
- Redundant Ethernet communications for enhanced reliability.
- Master MSLC-2 redundancy, loss of communications with the designated MSLC-2 master initiates control hand off to the next designated MSLC-2 master.
- The MSLC-2 hardware is adjustable for multiple applications.
- Slip frequency or voltage phase matching synchronizing fully selectable with dead bus option in both directions provide full flexibility for intertie and main-tie-main applications.
- Having functions integrated into one box eliminates the need for redundant sensors (like PTs, CTs, and MOPs) that connect to individual modules such as the load sensor and synchronizer.
- Digital signal processing makes the MSLC-2 resistant to power line distortions and harmonics.
- Three-phase true RMS power sensing provides accurate readings even with unbalanced phase loading and voltage fluctuations.
- Export/import control over multiple utility MSLC-2's in same segment.
- The Woodward ToolKit™ software allows flexible setup using the same basic menu tree as the original MSLC plus an overview screen. No hand held programmer is required. Graphical overview of generators and bus bar parameters with trending makes the MSLC-2 commissioning friendly.
- The Toolkit can be accessed either via one of the Ethernet ports or via RS-232 port.
- Phase angle compensation provides adjustment for additional deviation correction across a transformer.
- The system update feature allows for system reconfiguration.

- Applications for up to 32 generators with 16 mains and/or tie breakers
- Configurable for mains and tie breaker applications
- Complex applications with up to 8 bus segments
- Automatic segment recognition
- Redundant Ethernet communication for enhanced reliability
- The “system update” feature allows for system reconfiguration
- PLC and DCS compatible via Modbus RTU or Modbus TCP
- Automatic plant loading and unloading for bump-less load transfer to and from the utility
- Controls plant wide import/export levels against the utility
- Overall plant Power Factor control
- Ethernet or RS-232 port for configuration of device using Woodward ToolKit software
- UL/cUL & CE Listed

# SPECIFICATIONS

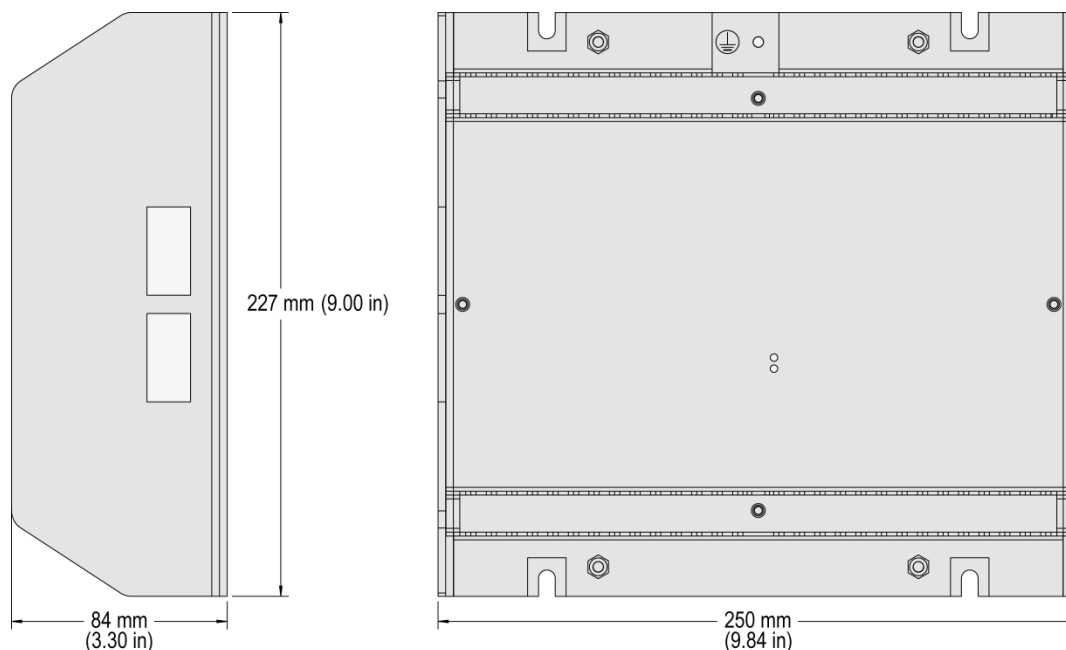
Power supply ..... 12/24 Vdc (8 to 40 Vdc)  
 Intrinsic consumption ..... max. 15 W  
 Ambient temperature (operation) ..... -40°C to 70°C / -40 to 158°F  
 Ambient temperature (storage) ..... -40°C to 85°C / -40 to 185°F  
 Ambient humidity ..... 95 %, non-condensing  
**Voltage** ..... (Δ/Δ)  
     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× $V_{rated}$   
 Measuring frequency ..... 50/60 Hz (40 to 85 Hz)  
 High Impedance Input; Resistance per path ..... [1] 0.498 MΩ, [4] 2.0 MΩ  
 Max. power consumption per path ..... < 0.15 W  
**Current (galvanically isolated)** Rated ( $I_{rated}$ ) ..... [1] ..1 A or [5] ..15 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× $I_{rated}$ , [5] 10× $I_{rated}$   
 Accuracy ..... Class 0.5

Setting range ..... 0.0 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 Bit  
**Housing** ..... Powder coated aluminum for back panel mounting  
 Dimensions WxHxD ..... 250 × 227 × 84 mm (9.84 × 9.00 × 3.30 in)  
 Connection ..... screw/plug terminals 2.5 mm<sup>2</sup>  
 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)

Power .....

# DIMENSIONS

Powder coated aluminum for back panel mounting



# TERMINAL DIAGRAM

80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61		
NO CONNECTION	PROCESS CONTROL	SETPOINT LOWER	SETPOINT RAISE	RAMP PAUSE	UTILITY UNLOAD	BASE LOAD	VOLTAGE LOWER	VOLTAGE RAISE	CB AUX	MAN	PERM	CHECK	COMMON	NO CONNECTION	B -	B +	NO CONNECTION	NO CONNECTION	NO CONNECTION		
DIGITAL INPUTS										SEGMENT NO											
160	159	158	157	156	155	154	153	152	151	150	149	148	147	146	145	144	143	142	141		
NO CONNECTION										COMMON	SYSTEM UPDATE	MODBUS RESET	IMP/EXP. CONTROL	81 ACT	78 ACT	67 ACT	56 ACT	45 ACT	34 ACT	23 ACT	12 ACT
DIGITAL INPUTS										SEGMENT NO											
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100		
NO CONNECTION	NO CONNECTION	REMOTE LOAD REFERENCE INPUT (4-20 mA / 0-10 V)	PROCESS SIGNAL INPUT (4-20 mA / 0-10 V)	REACTIVE LOAD INPUT (4-20 mA / 0-10 V)	NO CONNECTION																
SYSTEM A CURRENT										NO CONNECTION											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		

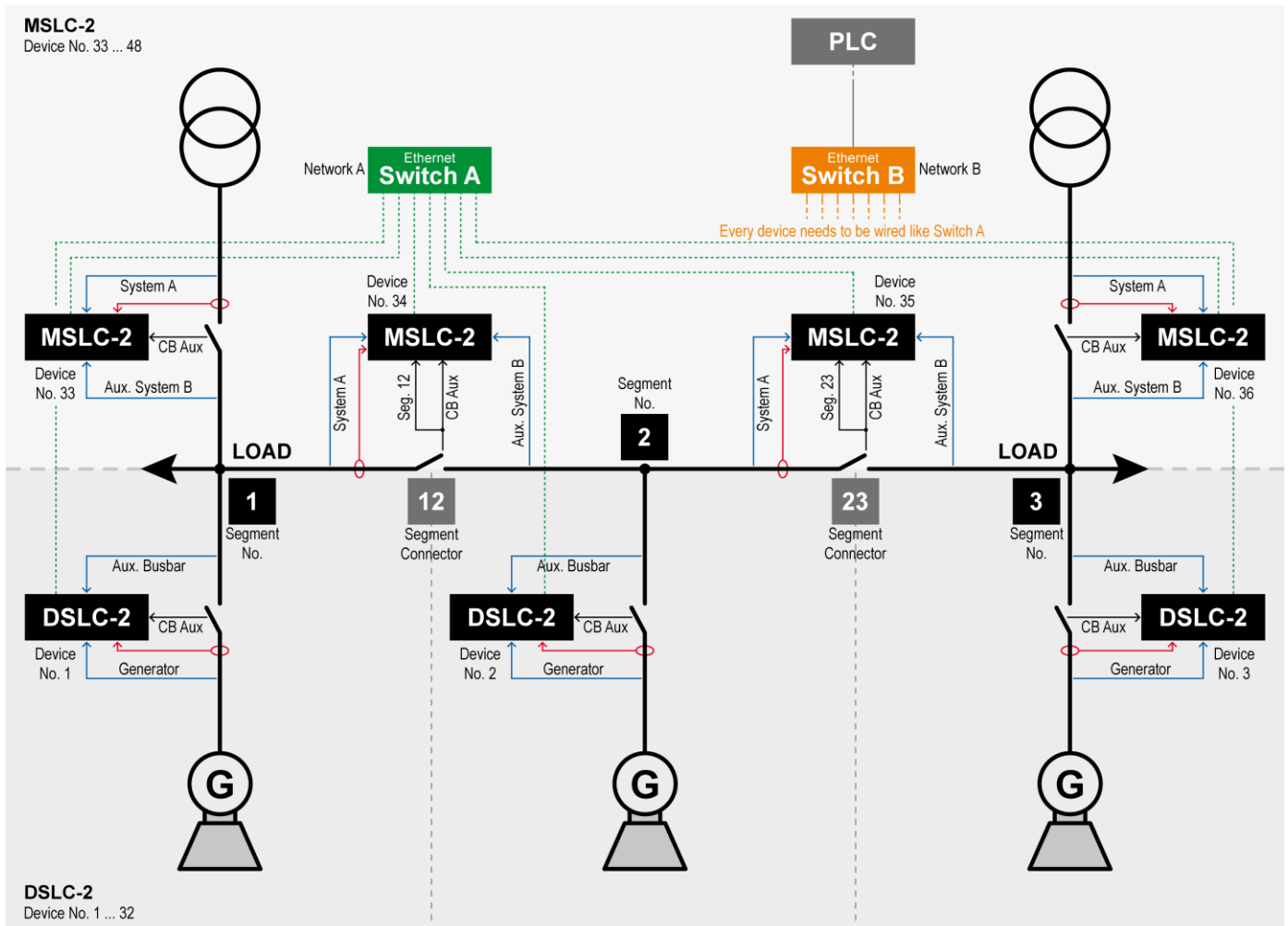
60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	
COMMON	LOAD SWITCH 2	LOAD SWITCH 1	ALARM 3	ALARM 2	ALARM 1	LCL/GEN BREAKER OPEN	BREAKER CLOSE	BREAKER OPEN	COMMON	LOW LIMIT	HIGH LIMIT	RELAY 2	SELF TEST OK	NO CONNECTION						
RELAY OUTPUTS														NO CONNECTION						

CPU OK  
SYNC  
ENABLE

AUXILIARY SYSTEM B VOLTAGE										SYSTEM A VOLTAGE										SYSTEM B VOLTAGE									
L1	L2	L3	N	L1	L2	L3	N	L1	L2/N	L1	L2	L3	N	L1	L2	L3	N	L1	L2/N	L1	L2/N								
120 V	480 V	120 V	480 V	120 V	480 V	120 V	480 V	120 V	480 V	120 V	480 V	120 V	480 V	120 V	480 V	120 V	480 V	120 V	480 V	120 V	480 V								
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42								

MSLC-2 – terminal diagram

# TYPICAL CONFIGURATION



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

**CONTACT**

**North & Central America**

Tel.: +1 970 962 7331  
 SalesPGD\_NAandCA@woodward.com

**South America**

Tel.: +55 19 3708 4800  
 SalesPGD\_SA@woodward.com

**Europe**

Tel. Stuttgart: +49 711 78954 510  
 Tel. Kempen: +49 2152 145 331  
 SalesPGD\_EUROPE@woodward.com

**Middle East & Africa**

Tel.: +971 2 6275185  
 SalesPGD\_MEA@woodward.com

**Russia**

Tel.: +7 812 319 3007  
 SalesPGD\_RUSSIA@woodward.com

**China**

Tel.: +86 512 8818 5515  
 SalesPGD\_CHINA@woodward.com

**India**

Tel.: +91 124 4399 500  
 SalesPGD\_INDIA@woodward.com

**ASEAN & Oceania**

Tel.: +49 711 78954 510  
 SalesPGD\_ASEAN@woodward.com

www.woodward.com

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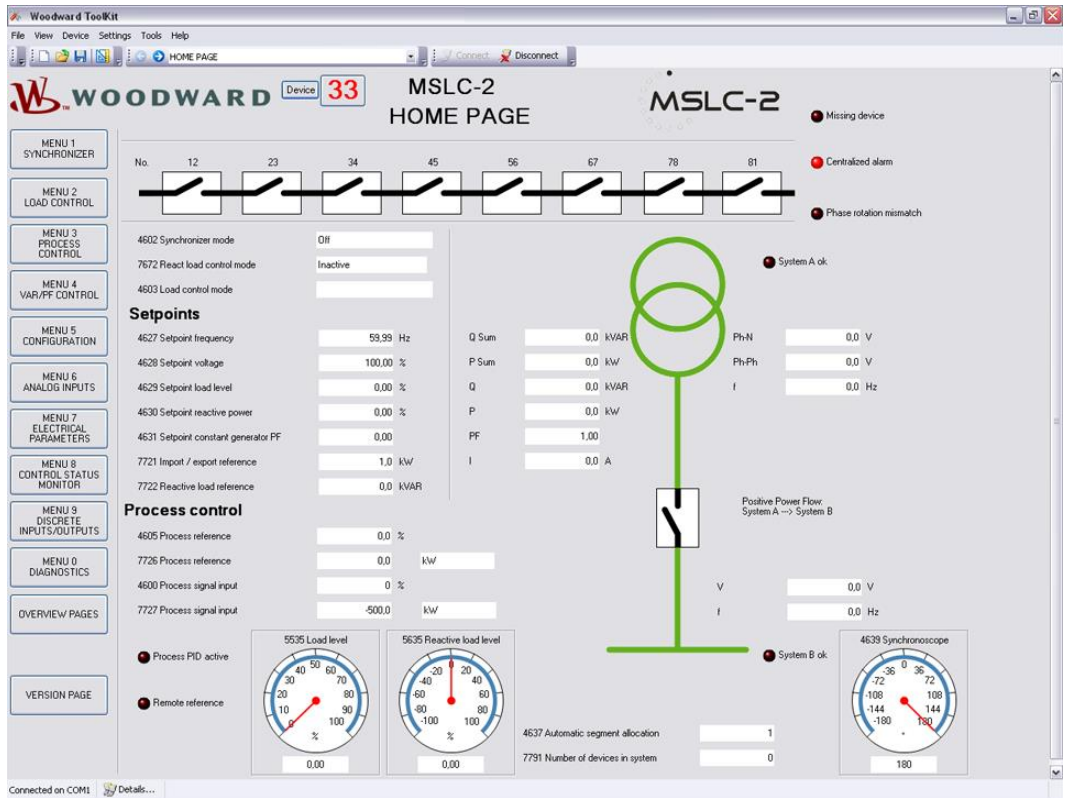
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For more information contact:

**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 MSLC-2 is communicating with. The MSLC-2 Home Page is shown below.

**Note:** The menu tree illustrated on the left side is similar to the original MSLC structure.



**FEATURES OVERVIEW**

	MSLC-2	DSLCL-2
<b>I/Os</b>		
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
<b>Listings/Approvals</b>		
UL / cUL Listing	✓	✓
GOST-R & CSA	✓	✓
LR & ABS Marine	✓	✓
CE Marked	✓	✓

**PART NUMBERS**

MSLC-2		DSLCL-2	
1A CT inputs P/N 8440-1977	5A CT inputs P/N 8440-1877	1A CT inputs P/N 8440-1978	5A CT inputs P/N 8440-1878
<b>Accessories</b>			
Spare connector kit - P/N 8923-1806			