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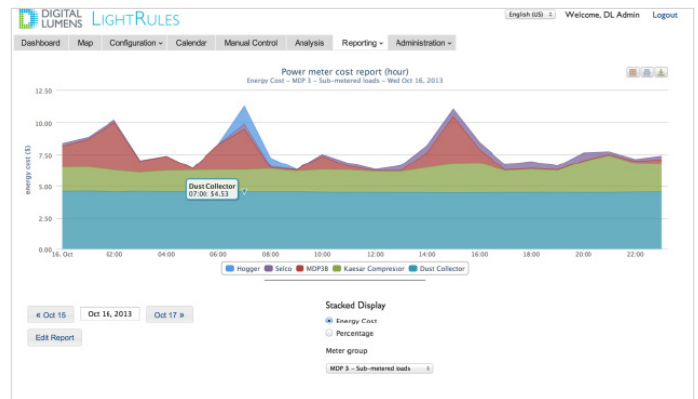
Project: _____

LightRules® Power

HARDWARE SPECIFICATIONS

LightRules® Power is a hardware-based power metering system that connects with LightRules® software from Digital Lumens. Once connected to LightRules Power, the LightRules software can record and report on the power consumption of one or more electrical circuits in a facility. LightRules Power makes it possible for facility management teams to:

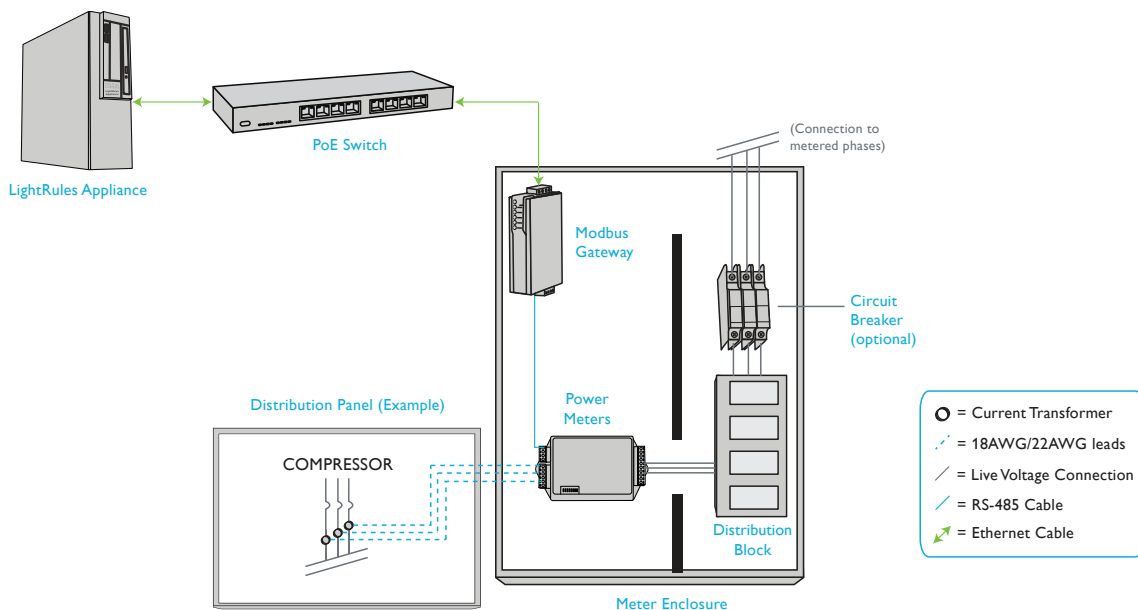
- Monitor all of the electrical loads in a building for a comprehensive view of consumption
- Measure the energy use of a particular system or piece of equipment to verify expected patterns of operation and consumption
- Manage energy use to reduce demand charges and avoid peak load penalties
- Analyze and optimize equipment use schedules to maximize utilization efficiency



Screenshot: LightRules Power energy cost report

SYSTEM DIAGRAM

In a single-, split-, or three-phase system, each load is monitored by its own WattNode Modbus® Power Meter, with each phase using a single current transformer. The power meters are connected to the Modbus gateway using an RS-485 cable. The Modbus gateway is then connected to the lighting network switch using an ethernet cable:



Modbus Power Meter¹

ELECTRICAL

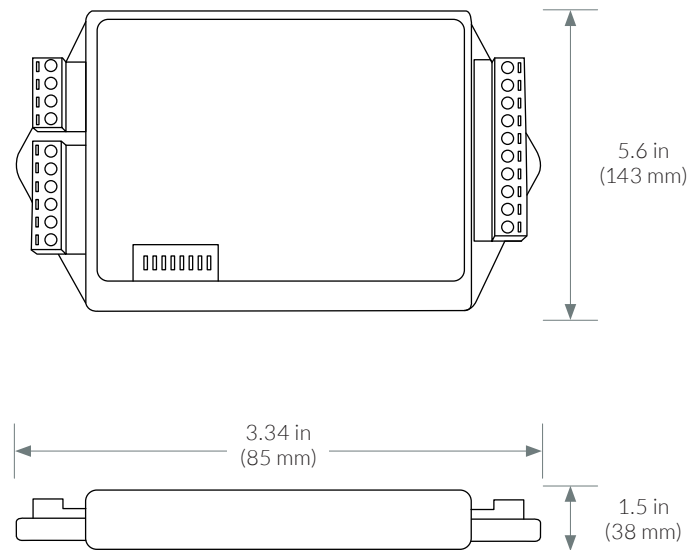
Operating Voltage Range	-20% to 15% of nominal
Power Line Frequency	50 to 60 Hz
CT Input	0.333 VAC nominal, 0 to 0.5 VAC operating, 3 VAC maximum

PHYSICAL

Enclosure	High impact, ABS plastic
Flame Resistance Rating	94V-0, IEC FV-0
Size	5.63 in x 3.34 in x 1.5 in (143 mm x 85 mm x 38 mm)
Weight	10.8 oz (305 gm)
Connectors	Euroblock style pluggable terminal blocks Green: 22 to 12 AWG (1.0 to 3.2 mm), 600 V Black: 22 to 12 AWG (1.0 to 3.2 mm), 300 V

ENVIRONMENTAL

Operating Temp.	-30°C to +55°C (-22°F to 131°F)
Humidity	5 to 90% RH up to 40°C, decreasing linearly to 50% RH at 55°C

Moxa Power Gateway²

ELECTRICAL

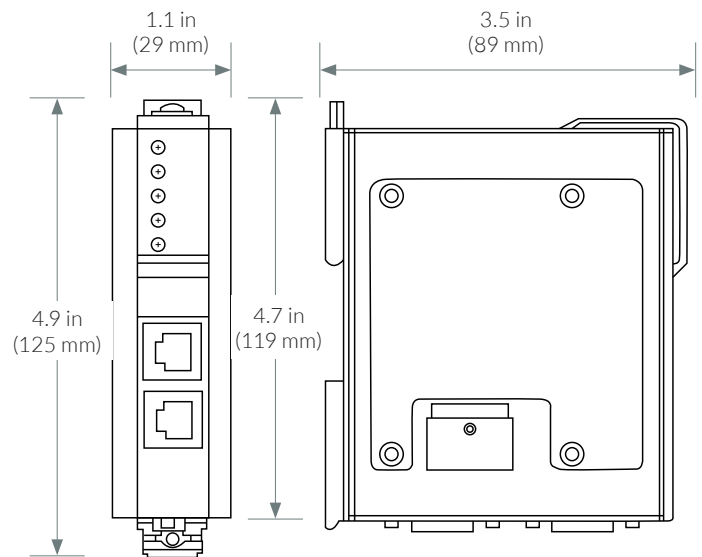
Operating Voltage Range	-20% to 15% of nominal
Power Line Frequency	50 to 60 Hz
CT Input	0.333 V AC nominal, 0 to 0.5 V AC operating, 3 V AC maximum

PHYSICAL

Enclosure	High impact, ABS plastic
Flame Resistance Rating	94V-0, IEC FV-0
Size	5.63 in x 3.34 in x 1.5 in (143 mm x 85 mm x 38 mm)
Weight	10.8 oz (305 gm)
Connectors	<ul style="list-style-type: none"> Euroblock style pluggable terminal blocks Green: 22 to 12 AWG (1.0 to 3.2 mm), 600 V Black: 22 to 12 AWG (1.0 to 3.2 mm), 300 V

ENVIRONMENTAL

Operating Temp.	-22° to 131° F (-30° to +55° C)
Humidity	5 to 90% RH up to 40° C, decreasing linearly to 50% RH at 55° C



¹ For more information, see http://www.ccontrols.com/w/WattNode_Modbus_-_Specifications

² For more information, see http://www.moxa.com/product/MGate_MB3180_3280_3480.htm

Ordering Process

Complete the following steps to identify the specific components required for a LightRules Power installation:

Define Requirements:

Step 1: Perform a walk-through of the facility. Identify each piece of equipment or electrical load to be monitored.

Step 2: With an electrician, remove the cover of each distribution panel to determine the following:

- a. Name of the load
- b. Name of the panel
- c. Name of the room or electrical closet
- d. Circuit breaker number
- e. Voltage
- f. Phase
- g. Maximum Load Current
- h. Conductor AWG / mm²
- i. Conductor count

Record (a) through (h) for each load here:

Load Name: Panel Name: Room Name: Circuit Breaker #: Voltage: Phase: Maximum Load Current: Conductor AWG/mm ² : Conductor Count:	Load Name: Panel Name: Room Name: Circuit Breaker #: Voltage: Phase: Maximum Load Current: Conductor AWG/mm ² : Conductor Count:	Load Name: Panel Name: Room Name: Circuit Breaker #: Voltage: Phase: Maximum Load Current: Conductor AWG/mm ² : Conductor Count:
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Select Hardware:

Current Transformers (CT's)

Referring to the requirements on the previous page and the ordering information on the next page, select appropriate current transformers for each phase conductor. Digital Lumens recommends purchasing CT's directly from [Continental Control Systems](#).

WattNode® Modbus® Power Meters

To accommodate both Wye and Delta transformers, and various voltage levels, LightRules Power is compatible with seven models of WattNode Modbus power meters. Select one power meter for each measured load. Order power meters from Digital Lumens or from [Continental Control Systems](#).

Moxa® MB3170 Gateways (RS-485 to Ethernet)

Moxa model number MB3170 gateways are compatible with LightRules Power. Select one Moxa Gateway per up to 127 power meters in each electrical closet or room. Order gateways from Digital Lumens, directly from [Moxa](#) (US only), or from a distributor.

Power Supplies for Moxa® MB3170 Gateways

Each gateway requires a 12-24 V DC power supply. Order gateway power supplies from Digital Lumens, directly from [Moxa](#) (US only), or from a distributor.

Order the following additional electrical supplies and equipment:

- RS-485 data/power cable to connect each power meter to a single gateway – the maximum run length per cable is 2000 ft (610 m).
- Electrical cabinets, one per gateway.
- Circuit breakers

Use the following tables to order current transformers, power meters, and power gateways.

Current Transformers

(Sold by Continental Control Systems)

Select one current transformer for each monitored conductor. Use the smallest current transformer possible for each monitored conductor's current and gauge. For applications not covered here, please contact Digital Lumens or Continental Control Systems for support.

Model	Type	Accuracy	Min. Rated Amps	Max. Rated Amps	Opening	Min. Conductor Size	Max. Conductor Size
CTM-03605-5	Split Core	+/- 1%	0.5	5	.30 x .34 in (.76 x .86 cm)	-	8 AWG (8.36 mm ²)
CTM-03605-15	Split Core	+/- 1%	1.5	15	.30 x .34 in (.76 x .86 cm)	-	8 AWG (8.36 mm ²)
CTM-03605-20	Split Core	+/- 1%	2	20	.30 x .34 in (.76 x .86 cm)	-	8 AWG (8.36 mm ²)
CTM-03605-30	Split Core	+/- 1%	3	30	.30 x .34 in (.76 x .86 cm)	-	8 AWG (8.36 mm ²)
CTM-03605-50	Split Core	+/- 1%	5	50	.30 x .34 in (.76 x .86 cm)	-	8 AWG (8.36 mm ²)
CTM-03605-70	Split Core	+/- 1%	7	70	.30 x .34 in (.76 x .86 cm)	-	8 AWG (8.36 mm ²)
ACT-0750-100	Split Core	+/- .75%	1	100	.78 x .78 in (1.98 x 1.98 cm)	6 AWG (13.3 mm ²)	3/0 AWG (85.0 mm ²)
ACT-0750-200	Split Core	+/- .75%	2	200	.78 x .78 in (1.98 x 1.98 cm)	6 AWG (13.3 mm ²)	3/0 AWG (85.0 mm ²)
ACT-0750-250	Split Core	+/- .75%	2.5	250	.78 x .78 in (1.98 x 1.98 cm)	6 AWG (13.3 mm ²)	3/0 AWG (85.0 mm ²)
ACT-1250-400	Split Core	+/- .75%	4	400	1.26 x 1.83 in (3.2 x 4.65 cm)	3/0 AWG (85.0 mm ²)	600 kcmil (304 mm ²)
ACT-1250-600	Split Core	+/- .75%	6	600	1.26 x 1.83 in (3.2 x 4.65 cm)	3/0 AWG (85.0 mm ²)	600 kcmil (304 mm ²)
CTB-1.5x3.5-0600	Split Core	+/- 1.5%	60	600	1.5 x 3.5 in (38.1 x 88.9 mm)		
CTB-1.5x3.5-0800	Split Core	+/- 1.5%	80	800	1.5 x 3.5 in (38.1 x 88.9 mm)		
CTB-4.0x4.0-0800	Split Core	+/- 1.5%	80	800	4.0 x 4.0 in (101.6 x 101.6 mm)		
CTB-4.0x4.0-1200	Split Core	+/- 1.5%	120	1200	4.0 x 4.0 in (101.6 x 101.6 mm)		
CTB-4.0x4.0-2000	Split Core	+/- 1.5%	200	2000	4.0 x 4.0 in (101.6 x 101.6 mm)		
CTB-4.0x4.5-3000	Split Core	+/- 1.5%	300	3000	4.0 x 4.5 in (101.6 x 114.3 mm)		
CTRC-03100-0400	Rogowski Coil	+/- 1%	20	400	3.15 in Diameter (8.0 cm)		
CTRC-03100-1000	Rogowski Coil	+/- 1%	50	1000	4.5 in Diameter (11.4 cm)		
CTRC-03100-2000	Rogowski Coil	+/- 1%	100	2000	7.5 in Diameter (19.05 cm)		
CTRC-03100-4000	Rogowski Coil	+/- 1%	200	4000	12.0 in Diameter (30.48 cm)		

Power Meters

ITEM	DIGITAL LUMENS PART NUMBER	MANUFACTURER PART NUMBER	TRANSFORMER & VOLTAGE COMPATIBILITY
WattNode Modbus Power Meter	WND48	WNC-3D-480-MB	3-Phase 3-Wire Delta 480V (No neutral), or 3-Phase 4-Wire Wye 277/480V
	WND40	WNC-3D-400-MB	3-Phase 3-Wire Delta 400V (No neutral), or 3-Phase 4-Wire Wye 230/400V
	WND24	WNC-3D-240-MB	Single-Phase 208V (No neutral) Single-Phase 240V (No neutral) Single-Phase 3-Wire 120/240V 3-Phase 3-Wire Delta 208V (No neutral) 3-Phase 4-Wire Wye 120/208V
	WNY60	WNC-3Y-600-MB	Single-Phase 347V with neutral, or 3-Phase 4-Wire Wye 347/600V
	WNY48	WNC-3Y-480-MB	Single-Phase 277V with neutral, or 3-Phase 4-Wire Wye 277/480V
	WNY40	WNC-3Y-400-MB	Single-Phase 230V with neutral 3-Phase 4-Wire Wye 230/400V
	WNY20	WNC-3Y-208-MB	Single-Phase 120V with neutral, or Single-Phase 3-Wire 120/240V, or 3-Phase 4-Wire Wye 120/208V

Power Gateways

ITEM	DIGITAL LUMENS PART NUMBER	MANUFACTURER PART NUMBER	DESCRIPTION
Moxa Gateway	MXGW1	MGate MB3170	1-port advanced Modbus gateway
	MXPS1	DR-4524	45W/2A DIN-Rail 24 VDC power supply with universal 85 to 264 VAC or 120-370 VDC input, -10 to 50°C operating temperature

