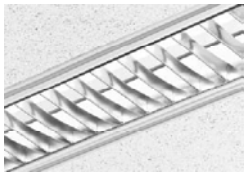
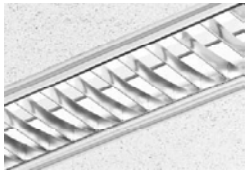
Appendix A | Luminaire Schedule

Sherrerd Hall | Princeton University

Luminaire Schedule

Refer to attached lighting fixture details for complete information.

Type	Image	Description	Input Watts	Volts	Lamp	Mfr	Catalogue #	Quantity
FA		Recessed (1) lamp linear fluorescent 2.5" x 4' downlight, with silky specular aluminum parabolic louvers for glare control, silver interior finish, and integral electronic Lutron EcoSystem dimming ballast.	32.6	277	(1) Philips F28T5/835/ ALTO	Se'Lux	M60-1T5-MP-SG-004-WH-277-DM (EC5 T528 J UNV 1)	16
FB		Recessed (1) lamp linear fluorescent 2.5" x 4' downlight, with silky specular aluminum parabolic louvers for glare control, silver interior finish, and integral electronic Lutron EcoSystem dimming ballast.	56.5	277	(1) Philips F54T5/835/ HO/ ALTO	Se'Lux	M60-1T5HO-MP-SG-004-WH-277-DM (EC5 T554 J UNV 1)	4
FC		Semi-recessed linear fluorescent nominal 4' wall washer with semi-gloss white aluminum housing, extruded aluminum reflector with clear anodized specular finish, and integral electronic Lutron EcoSystem dimmingballast.	56.5	277	(1) Philips F54T5/835/ HO/ ALTO	Elliptipar	F210-T155-L-02-2-000-DM (EC5 T554 J UNV 1)	6

Type	Image	Description	Input Watts	Volts	Lamp	Mfr	Catalogue #	Quantity
FD		Semi-recessed (1) lamp compact fluorescent 10" x 10" step light, with die-cast aluminum housing, one piece die-cast aluminum faceplate with stepped baffle, semi-specular anodized aluminum internal reflector, bronze finish, and integral electronic ballast.	18	277	(1) Philips PL-T 18W/835/4P/ALTO	Bega	3042P-18WCF-BRZ	12
FE		Recessed (1) lamp linear fluorescent 4" x 4' downlight, with acrylic satine lens, silver interior finish, and integral electronic Lutron EcoSystem dimming ballast.	32.6	277	(1) Philips F28T5/835/ALTO	Se'Lux	M10-1T5-SD-SG-004-WH-277-DM (EC5 T528 J UNV 1)	16
FF		Surface slot mounted 2700K CCT LED 2.7" x 1' x 2.8" wall grazer with extruded anodized aluminum housing, clear polycarbonate lens, 10^{o} x 60^{o} beam angle, integral driver with Powercore technology eliminating the need for low-voltage external power supplies, and ELV control dimmer.	15	277	Philips Class 2 LED-2700K-404 lm	Philips Color Kinetics	eW Graze Powercore 2700 K - 523-000030-08-910503700284	84

Type	Image	Description	Input Watts	Volts	Lamp	Mfr	Catalogue #	Quantity
FG		Recessed (1) lamp compact fluorescent nominal 6" diameter downlight, with rigid steel housing painted optical matte black, two reflector optical system of specular clear Alzak cones, and integral electronic Lutron EcoSystem dimming ballast.	42.6	277	(1) Philips PL-T 42W/835/4P/ALTO	Kurt Versen	P927-42W-DM (Lutron EcoSystem EC3DT442KU1-277V)	3
FH		Recessed (1) lamp compact fluorescent nominal 6" diameter wall washer, with rigid steel housing painted optical matte black, two reflector optical system of specular clear Alzak cones, and integral electronic Lutron EcoSystem dimming ballast.	42.6	277	(1) Philips PL-T 42W/835/4P/ALTO	Kurt Versen	P915-42W-DM (Lutron EcoSystem EC3DT442KU1-277V)	3

Type	Image	Description	Input Watts	Volts	Lamp	Mfr	Catalogue #	Quantity
FI		Semi-recessed (1) lamp low-voltage halogen nominal 4" diameter spotlight, with black powder-coated cast aluminum housing, white plastic mounting ring with black powder-coated cast aluminum multigroove baffle, cardanic suspension of luminaire in mounting ring with lockable 0-40° tilt, black plastic anti-glare ring as lamp retainer, mounting box for preinstallation with junction box, Lightolier 277/120V transformer for entire circuit, and B+L electronic 120/12V 60 Hz transformer/dimmer.	20	120/ 12	(1) Philips 20MRC11/F L30 PRO FTD	Erco	Erco 88199.023-MRC11-20W-12V-GU4-38° Lightolier Calculite 7997 B+L CV90049	3

Type	Image	Description	Input Watts	Volts	Lamp	Mfr	Catalogue #	Quantity
FJ		Semi-recessed (1) lamp low-voltage halogen nominal 7" diameter spotlight, with black powder-coated cast aluminum housing, white plastic mounting ring with black powder-coated cast aluminum multigroove baffle, cardanic suspension of luminaire in mounting ring with lockable 0-40° tilt, black plastic anti-glare ring as lamp retainer, mounting box for preinstallation with junction box, Lightolier 277/120V transformer for entire circuit, and B+L electronic 120/12V 60 Hz transformer/dimmer.	50	120/12	(1) Philips 50PAR36Q/FL30	Erco	Erco 88135.023-PAR36-50W-12V-Screw Term-30° Lightolier Calculite 7997 B+L CV90049	6
FK		Suspended linear fluorescent nominal 6" x 4' indirect/direct luminaire with matte white painted extruded aluminum housing, die-formed diffuse aluminum reflector, parabolic semi-specular aluminum louvers, and integral electronic Lutron EcoSystem dimming ballast.	32.6	277	(1) Philips F28T5/835/ALTO	Peerless	PLA-IND-4FT-1T5-CG-EDB-277-PB-WE	130
FL		Channel mounted 6500K CCT LED nominal 0.5"x 38" edge lighter with flexible housing that can be cut to 6 LED segment sand Sylvania Optotronic 24V power supply.	2/LF	277	(33/LF) Sylvania White 3rd Generation LED- 6500K-82 lm/LF	Sylvania	LLMULTIFLX/THN/W3-865-3.2 FT	340 LF

Type	Image	Description	Input Watts	Volts	Lamp	Mfr	Catalogue #	Quantity
FM		Surface slot mounted 3500K CCT LED nominal 0.4" x 9' wall grazer with length customization to within 6 LEDs, 1.4" x 18" mounting track segments, prismatic lens, and Sylvania Optotronic 24V power supply.	8/LF	277	(13/LF) Sylvania White 3rd Generation Fine Bin LED-3500K-272 lm/LF	Sylvania	LNRPWRFLX/ LM10P/W3F-835 LINEARlight Track 1.5P	308 LF
FN		Track-mounted metal halide 4" diameter by 6.5" tall spotlight with aluminum housing and white finish, wrench-locking swivel for vertical and horizontal aiming, cross-baffle for glare control, lexan fitting for LSI track, and integral electronic ballast.	45	277	Philips CDM35/PAR 20/830/FL30	Lighting Services Inc	MHLN203-00-WL-W-MHLN1621FR	4
FO		Recessed (1) lamp linear fluorescent 4" x 4' downlight, with acrylic satine lens, silver interior finish, and integral electronic Lutron EcoSystem dimming ballast.	32.6	277	(1) Philips F28T5/835/ ALTO	Se'Lux	M10-1T5-SD-SG-004-WH-277-DM (EC5 T528 J UNV 1)	82

Appendix B | Lighting Fixture Specifications

M60 Recessed Linear Fluorescent Slot Grid / Thick Ceiling Panel

se'lux®

Project: _____ **Type:** _____ **Qty:** _____

M60	– 1T5	– MP	– SG	– 004	– WH	– 277	–
Fixture Series	**Lamp Type**	**Shielding**	**Mounting**	**Nominal Length**	**Finish**	**Voltage**	

DM – _____ – _____ – _____ – _____ – _____ – _____ – _____ – _____

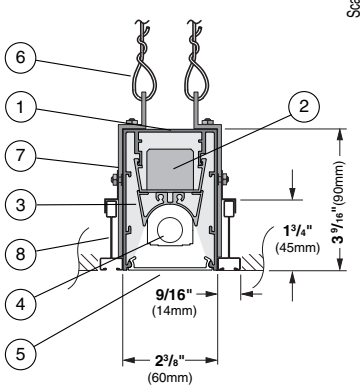
Options (refer to separate data sheets for ordering codes and details)

Fixture Series	Lamp Type	Shielding	Mounting	Nominal Length	Finish	Voltage	Options
M60 M60 Recessed Multi-Mount Form	**1T5** F28T5 **1T5HO** F54T5HO	**MA** Matte Parabolic **MP** Silky Specular Parabolic Louver **SD** Satine Lens **OD** Extra Diffuse Lens	**SG** Slot Grid **DC** Ceiling Panels up to 2" thick (lengths per submittal drawings)	**004** 4 foot **008** 8 foot **012** 12 foot For actual lengths see following page. For other lengths, configurations indicate nominal length rounded to the next highest foot. Factory will supply layout drawings. Individual fixtures cannot be field joined.	**WH** White **BK** Black **SV** Silver **SP** Specify RAL#	**120** **277** **347**	**TB** Lengths to Fit 2' Grid T-Bar Ceiling System **(qty.)EM** Stand-by Battery Pack[1] (prefix quantity, i.e. - **5EM**) **FS** Single Fusing **DM** Dimming[1] (specify system) **DMA** Digital Addressable Dimming[1] **SI** Satine Acrylic Inlay[2] **FW** Flex Whip (standard) **FW1** Flex Whip (dimming) **Track** Eutrac Standard[3] **DL** Suitable for Damp Locations **CCEA** Chicago Plenum **Downlights** (See MR11 spec sheet, pp.98)

[1]Must be low profile ballasts (1³/₈" W x 1³/₁₆" H); consult factory for details. [2]Available for MP Louver only. [3]Consult factory for details.

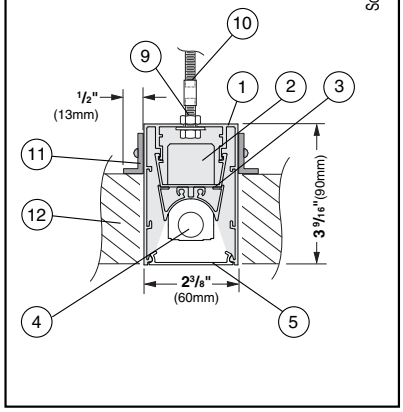
Slot Grid (SG)

Scale = 1 : 4



Ceiling Panels up to 2" thick (DC)

Scale = 1 : 4



1. Housing - Continuous, 6063-T5 extruded aluminum profile up to 16 feet long.

2. Ballast - Electronic, high power factor, class "P", type "A" sound rating. Specify 120v, 277v, or 347v. Ballast is factory pre-wired with leads to one end of fixture. Consult factory for ballast options.

3. Gear Tray - Extruded aluminum, with white painted finish. Gear tray installed as a complete electrical unit and is held in place with knurled dress nuts. It is fully accessible from below ceiling.

4. Lamps - As noted (by others). Other lamp lengths or wattages available, consult factory.

5. Shielding - Louvers offer excellent glare control in longitudinal, lateral, and all diagonal planes. High quality aluminum louvers and acrylic shielding allow true freedom of layout for today's modern spaces.

6. Support Wire to Structure - Supplied and installed by others.

7. Support Bracket - Supplied nominally every four feet.

8. Slot Grid Beam and Cross Tees - Supplied and installed by others.

9. Pre-installed 1" 1/4-20 Stud - Attached to fixture every nominal 4 feet.

10. Coupling and Threaded Rod to Structure - Supplied and installed by others.

11. Aluminum Angle Brackets - Run entire length of fixture to block view into plenum area from below fixture.

12. Ceiling Panels up to 2" Thick - Supplied and installed by others. Suitable for Decoustic[fi] ceiling panel installations. Other ceiling systems possible, please consult factory. Decoustic[fi] is a registered trademark of Decoustics Ltd. Corporation.

Interior Luminaire Finish - Standard interior colors are White (WH), Black (BK) and Silver (SV). RAL Classic colors (SP) are available, please specify RAL#.

TEL: (845) 691-7723
FAX: (845) 691-6749
www.selux.com/usa
M60_SG-01 (v5.0)

c UL us LISTED
Union Made Affiliated with **IBEW** *Local 363*

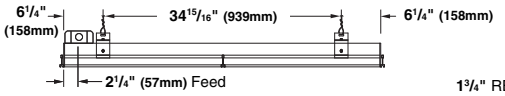
M60 Recessed Linear Fluorescent Slot Grid / Thick Ceiling Panel

se'lux

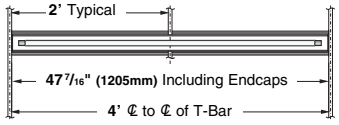
M60 Slot Grid Layout Dimensions

Nominal 4 foot Individual

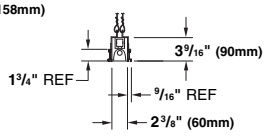
Side View



Bottom View

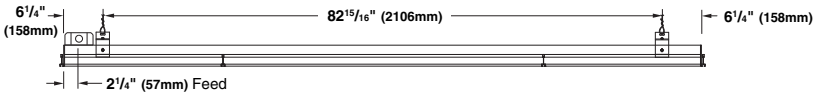


Typical End View (all lengths)

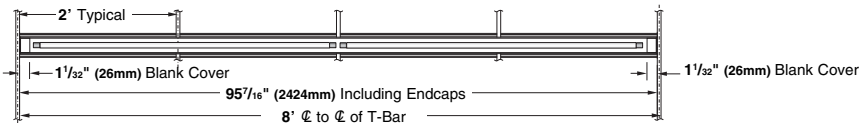


Nominal 8 foot Individual

Side View

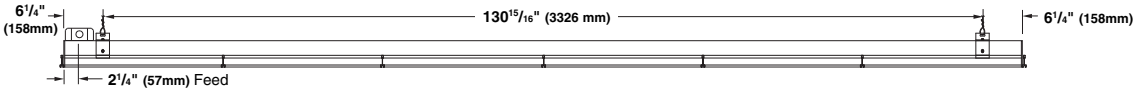


Bottom View



Nominal 12 foot Individual

Side View



Bottom View

Fixture supplied with 7/8 knockout located 2 1/4" from end in top of fixture.

For other lengths, lamping, continuous runs or configurations please specify overall length (in feet), accessories desired and sketch/drawing of configuration. SELUX will detail project drawings upon order and supply submittal drawings for approval. Individual fixtures cannot be field joined. If you have any questions please contact SELUX customer service or applications engineering for assistance (1-800-SELUX-CS).

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PO Box 1060, 5 Lumen Lane / Highland, NY 12528
TEL: (845) 691-7723 / FAX: (845) 691-6749
E-mail: seluxus@selux.com / Web Site: www.selux.com/usa
M60_SG-02 (02/06)

EcoSystem Ballasts for linear T5 Lamps

Lamp	No. of	Model	Case Size	Input Voltage (VAC)	Input Current (A)	Input Power (W)	Ballast Factor (BF)	System Lumens (lm)	System Efficacy (lm/W)	Ballast Efficacy Factor	Relative Efficacy (RSE)
F35T5 (57.1 in.)	1	EC5 T535 J UNV 1	J	277 240 120	0.15 0.18 0.35	42.0 42.3 42.2	1.0 1.0 1.0	3650 3650 3650	87 87 87	2.38 2.38 2.38	0.83 0.83 0.83
F28T5 (45.2 in.)	2	EC5 T528 J UNV 2	J	277 240 120	0.23 0.27 0.54	64.5 65.0 65.2	1.0 1.0 1.0	5800 5800 5800	90 89 89	1.55 1.54 1.53	0.87 0.86 0.86
	1	EC5 T528 J UNV 1	J	277 240 120	0.12 0.14 0.27	32.6 32.9 32.9	1.0 1.0 1.0	2900 2900 2900	89 88 88	3.07 3.04 3.04	0.86 0.85 0.85
F21T5 (33.4 in.)	2	EC5 T521 J UNV 2	J	277 240 120	0.17 0.20 0.39	46.0 47.2 47.2	1.0 1.0 1.0	4200 4200 4200	91 89 89	2.17 2.12 2.12	0.91 0.89 0.89
	1	EC5 T521 J UNV 1	J	277 240 120	0.09 0.11 0.22	25.8 25.8 25.8	1.0 1.0 1.0	2100 2100 2100	81 81 81	3.88 3.88 3.88	0.81 0.81 0.81
F14T5 (21.6 in.)	2	EC5 T514 J UNV 2	J	277 240 120	0.12 0.14 0.28	32.8 33.3 33.3	1.0 1.0 1.0	2700 2700 2700	82 81 81	3.05 3.00 3.00	0.85 0.85 0.85
	1	EC5 T514 J UNV 1	J	277 240 120	0.07 0.08 0.16	19.0 19.2 19.2	1.0 1.0 1.0	1350 1350 1350	71 70 70	5.26 5.21 5.21	0.74 0.74 0.74

LUTRON® SPECIFICATION SUBMITTAL Page 4

Job Name:	Model Numbers:	
Job Number:		

28W/835 Min Bipin T5 HE ALTO UNP

Product family description

High efficiency, environmentally responsible, ultra-slim lamps.

Features/Benefits

- Slim profile lamp and ballast.
- Better for the environment.
- Operates on programmed start ballasts.
- Fail-safe operation at end of life.
- Design flexibility.
- Improved optical control.
- Fixtures can be 40% smaller than T8 systems.
- Better fit in 2 x 2 and 2 x 4 grid ceilings.
- Low mercury (14W, 21W and 28W.)
- Energy efficient.
- Less material for less waste.

Applications

- Ideal for general, decorative and architectural lighting in offices, retail stores, hotels, schools and hospitals.

Notes

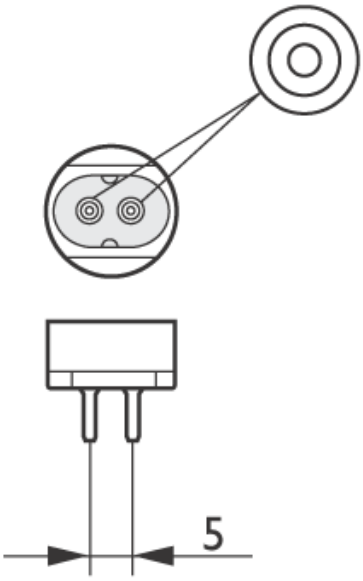
- Silhouette™ T5 nominal lamp lengths are shorter than standard sizes. See dimension chart for details.

Product data	
Product Number	230854
Full product name	28W/835 Min Bipin T5 HE ALTO UNP
Ordering Code	230854
Pack type	Unpacked
Pieces per Sku	1
Skus/Case	40
Pack UPC	046677230852
EAN2US	
Case Bar Code	50046677230857
Successor Product number	
System Description	High Efficiency
Base	Miniature Bipin
Base Information	Green [Green Base]
Bulb	T5 [16 mm]

PHILIPS

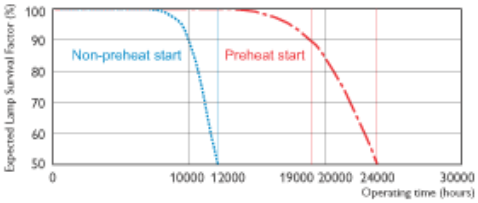
Product data	
Packing Type	UNP [Unpacked]
Packing Configuration	40
Rated Avg. Life	24000 hr
Type	na
Feature	na [Not Applicable]
Ordering Code	F28T5/835/ALTO
Pack UPC	046677230852
Case Bar Code	50046677230857
Watts	28W
Dimmable	Yes
Color Code	835 [CCT of 3500K]
Color Rendering Index	82 Ra8
Color Designation	White
Color Description	835 White
Color Temperature	3500 K
Initial Lumens	2900 Lm
Overall Length C	1163.2 mm
Diameter D	17 mm
Special packing	ALTO
Product Number	230854

TL5 HE



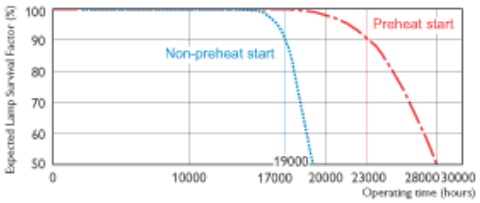
Base Miniature Bipin

PHILIPS



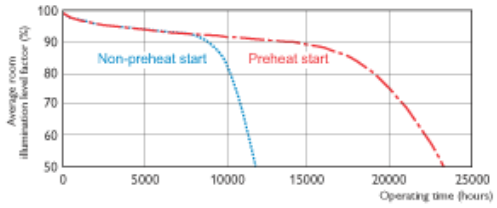
Life Expectancy 3h cycle

TL5 HE



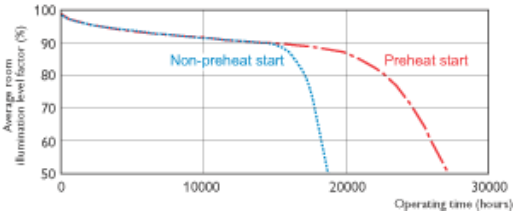
Life Expectancy 12h cycle

TL5 HE



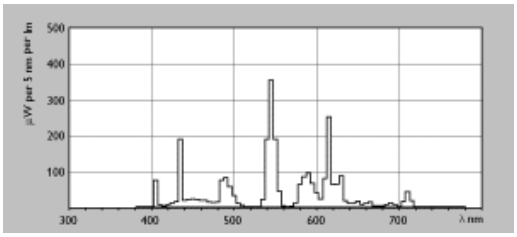
Service Life 3h cycle

TL5 HE



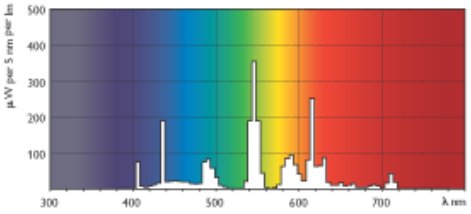
Service Life 12h cycle

TL5 HE



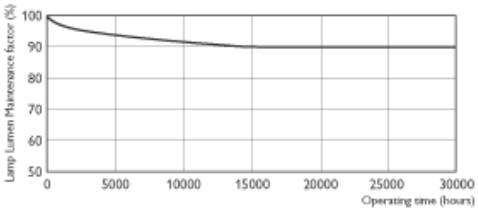
Lightcolor /835

TL5 HE/835

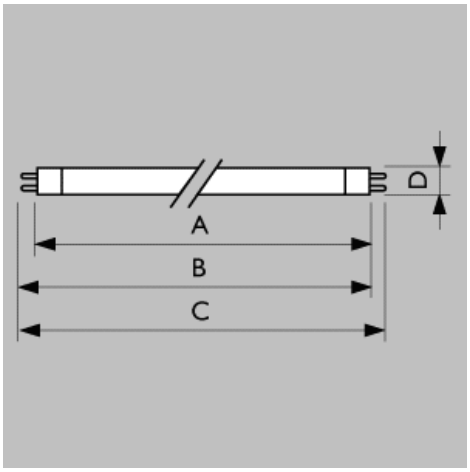


Lightcolor /835

TL5 HE/835



TL5 HE



TL5 HE

	A	B	B	C	D
Full product name	Max	Min	Max	Max	Max
28W/ 835 Min Bipin T5 HE ALTO UNP	1149.0	1153.7	1156.1	1163.2	17

M60 Recessed Linear Fluorescent Slot Grid / Thick Ceiling Panel

se'lux®

Project: _____ **Type:** _____ **Qty:** _____

M60 – 1T5HO – MP – SG – 004 – WH – 277 –

Fixture Series	Lamp Type	Shielding	Mounting	Nominal Length	Finish	Voltage

DM – – – – – – – – –

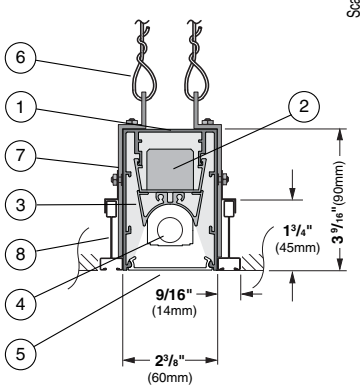
Options (refer to separate data sheets for ordering codes and details)

Fixture Series	Lamp Type	Shielding	Mounting	Nominal Length	Finish	Voltage	Options
M60 M60 Recessed Multi-Mount Form	**1T5** F28T5 **1T5HO** F54T5HO	**MA** Matte Parabolic **MP** Silky Specular Parabolic Louver **SD** Satine Lens **OD** Extra Diffuse Lens	**SG** Slot Grid **DC** Ceiling Panels up to 2" thick (lengths per submittal drawings)	**004** 4 foot **008** 8 foot **012** 12 foot For actual lengths see following page. For other lengths, configurations indicate nominal length rounded to the next highest foot. Factory will supply layout drawings. Individual fixtures cannot be field joined.	**WH** White **BK** Black **SV** Silver **SP** Specify RAL#	**120** **277** **347**	**TB** Lengths to Fit 2' Grid T-Bar Ceiling System **(qty.)EM** Stand-by Battery Pack[1] (prefix quantity, i.e. - **5EM**) **FS** Single Fusing **DM** Dimming[1] (specify system) **DMA** Digital Addressable Dimming[1] **SI** Satine Acrylic Inlay[2] **FW** Flex Whip (standard) **FW1** Flex Whip (dimming) **Track** Eutrac Standard[3] **DL** Suitable for Damp Locations **CCEA** Chicago Plenum **Downlights** (See MR11 spec sheet, pp.98)

[1]Must be low profile ballasts (1³/₈" W x 1³/₁₆" H); consult factory for details. [2]Available for MP Louver only. [3]Consult factory for details.

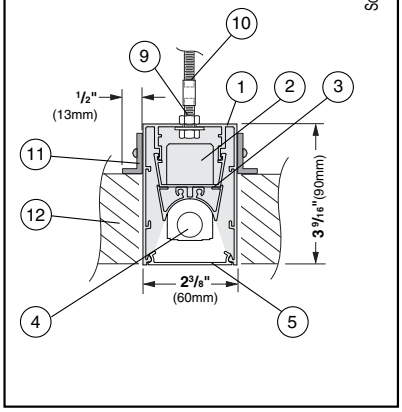
Slot Grid (SG)

Scale = 1 : 4



Ceiling Panels up to 2" thick (DC)

Scale = 1 : 4



1. Housing - Continuous, 6063-T5 extruded aluminum profile up to 16 feet long.

2. Ballast - Electronic, high power factor, class "P", type "A" sound rating. Specify 120v, 277v, or 347v. Ballast is factory pre-wired with leads to one end of fixture. Consult factory for ballast options.

3. Gear Tray - Extruded aluminum, with white painted finish. Gear tray installed as a complete electrical unit and is held in place with knurled dress nuts. It is fully accessible from below ceiling.

4. Lamps - As noted (by others). Other lamp lengths or wattages available, consult factory.

5. Shielding - Louvers offer excellent glare control in longitudinal, lateral, and all diagonal planes. High quality aluminum louvers and acrylic shielding allow true freedom of layout for today's modern spaces.

6. Support Wire to Structure - Supplied and installed by others.

7. Support Bracket - Supplied nominally every four feet.

8. Slot Grid Beam and Cross Tees - Supplied and installed by others.

9. Pre-installed 1" 1/4-20 Stud - Attached to fixture every nominal 4 feet.

10. Coupling and Threaded Rod to Structure - Supplied and installed by others.

11. Aluminum Angle Brackets - Run entire length of fixture to block view into plenum area from below fixture.

12. Ceiling Panels up to 2" Thick - Supplied and installed by others. Suitable for Decoustic[fi] ceiling panel installations. Other ceiling systems possible, please consult factory. Decoustic[fi] is a registered trademark of Decoustics Ltd. Corporation.

Interior Luminaire Finish - Standard interior colors are White (WH), Black (BK) and Silver (SV). RAL Classic colors (SP) are available, please specify RAL#.

TEL: (845) 691-7723
FAX: (845) 691-6749
www.selux.com/usa
M60_SG-01 (v5.0)

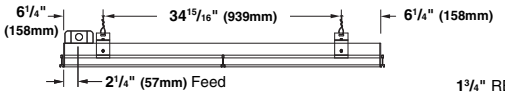
c UL us LISTED
Union Made Affiliated with **IBEW** *Local 363*

M60 Recessed Linear Fluorescent Slot Grid / Thick Ceiling Panel

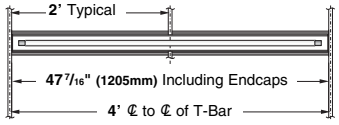
M60 Slot Grid Layout Dimensions

Nominal 4 foot Individual

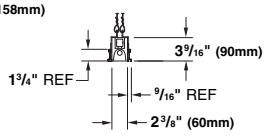
Side View



Bottom View

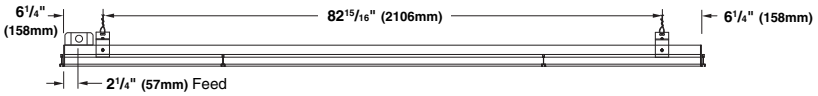


Typical End View (all lengths)

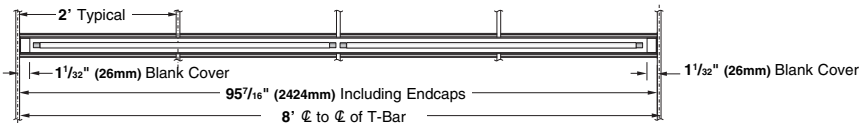


Nominal 8 foot Individual

Side View

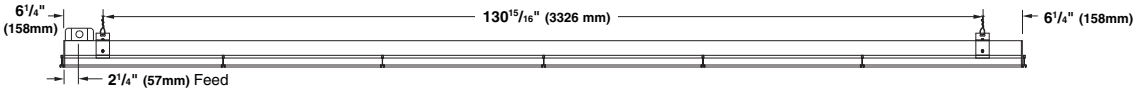


Bottom View

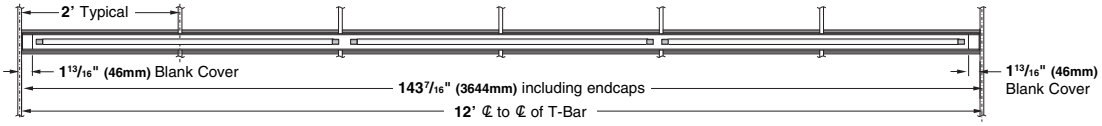


Nominal 12 foot Individual

Side View



Bottom View



Fixture supplied with 7/8 knockout located 2 1/4" from end in top of fixture.

For other lengths, lamping, continuous runs or configurations please specify overall length (in feet), accessories desired and sketch/drawing of configuration. SELUX will detail project drawings upon order and supply submittal drawings for approval. Individual fixtures cannot be field joined. If you have any questions please contact SELUX customer service or applications engineering for assistance (1-800-SELUX-CS).

SELUX Corp. © 2006
PO Box 1060, 5 Lumen Lane / Highland, NY 12528
TEL: (845) 691-7723 / FAX: (845) 691-6749
E-mail: seluxus@selux.com / Web Site: www.selux.com/usa
M60_SG-02 (02/06)

EcoSystem Ballasts for linear T5 HO Lamps

Lamp	No. of Lamps	Model	Case Size	Input Voltage (VAC)	Input Current (A)	Input Power (W)	Ballast Factor (BF)	System Lumens (lm)	System Efficacy (lm/W)	Ballast Efficacy Factor	Relative Efficacy (RSE)
F54T5 (45.2 in.)	2	EC5 T554 J UNV 2	J	277 240 120	0.40 0.50 0.99	110.1 119.0 119.3	1.0 1.0 1.0	10,000 10,000 10,000	91 84 84	0.91 0.84 0.84	0.98 0.91 0.91
	1	EC5 T554 J UNV 1	J	277 240 120	0.21 0.24 0.48	56.5 58.0 57.9	1.0 1.0 1.0	5000 5000 5000	88 86 86	1.77 1.73 1.73	0.96 0.93 0.93
F39T5 (33.4 in.)	2	EC5 T539 J UNV 2	J	277 240 120	0.30 0.35 0.70	83.0 84.0 84.3	1.0 1.0 1.0	7000 7000 7000	84 83 83	1.20 1.19 1.19	0.94 0.93 0.93
	1	EC5 T539 J UNV 1	J	277 240 120	0.16 0.18 0.37	43.3 44.0 44.0	1.0 1.0 1.0	3500 3500 3500	81 80 80	2.31 2.27 2.27	0.90 0.89 0.89
F24T5 (21.6 in.)	2	EC5 T524 J UNV 2	J	277 240 120	0.20 0.23 0.45	54.8 54.0 53.9	1.0 1.0 1.0	4000 4000 4000	73 74 74	1.82 1.85 1.86	0.89 0.89 0.89
	1	EC5 T524 J UNV 1	J	277 240 120	0.11 0.12 0.24	30.0 28.8 28.8	1.0 1.0 1.0	2000 2000 2000	67 69 69	3.33 3.47 3.47	0.80 0.83 0.83

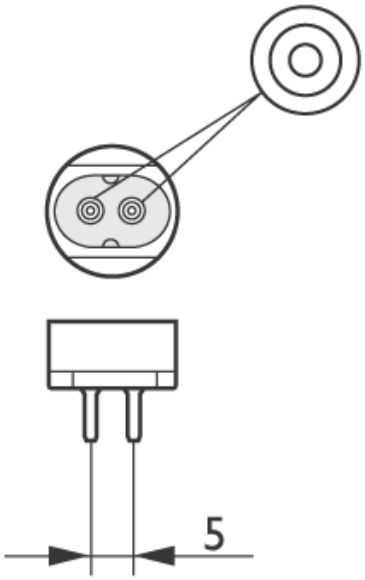
F54T5 835 HO ALTO TG

Product family description

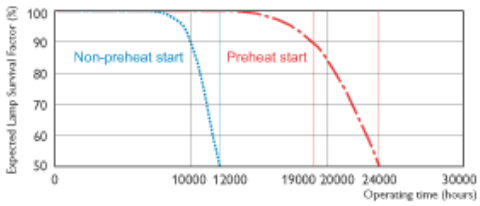
Product data	
Product Number	166728
Full product name	F54T5 835 HO ALTO TG
Ordering Code	F54T5/835/HO/ALTO TG
Pack type	1 Lamp
Pieces per Sku	1
Skus/Case	40
Pack UPC	046677166724
EAN2US	
Case Bar Code	50046677166729
Successor Product number	
System Description	High Output
Base	Miniature Bipin
Base Information	Green [Green Base]
Bulb	T5 [16 mm]
Packing Type	1LP [1 Lamp]
Packing Configuration	40
Rated Avg. Life	24000 hr
Type	F54T5
Feature	ALTO®
Ordering Code	F54T5/835/HO/ALTO TG
Pack UPC	046677166724
Case Bar Code	50046677166729
Watts	54W
Dimmable	Yes
Mercury (Hg) Content	
Color Code	835 [CCT of 3500K]
Color Rendering Index	85 Ra8
Color Designation	835
Color Description	na [-]
Color Temperature	3500 K
Initial Lumens	5000 Lm
Overall Length C	1163.2 mm
Diameter D	17 mm
Product Number	166728

PHILIPS

TL5 HO

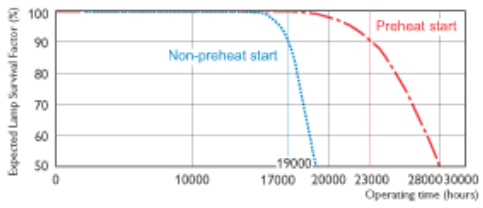


Base Miniature Bipin



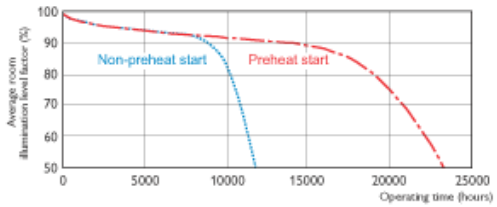
Life Expectancy 3h cycle

TL5 HO



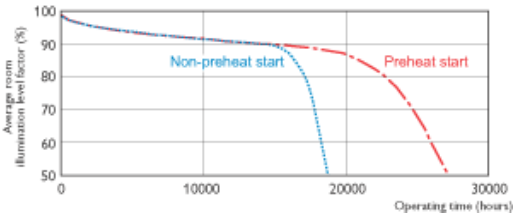
Life Expectancy 12h cycle

TL5 HO



Service Life 3h cycle

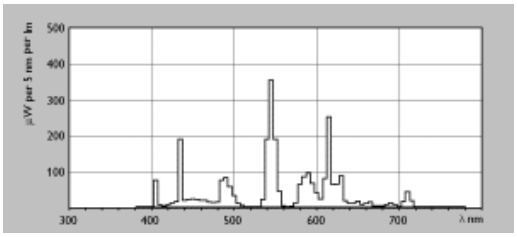
TL5 HO



Service Life 12h cycle

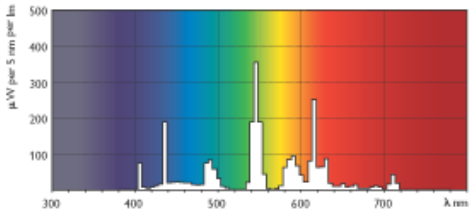
TL5 HO

PHILIPS



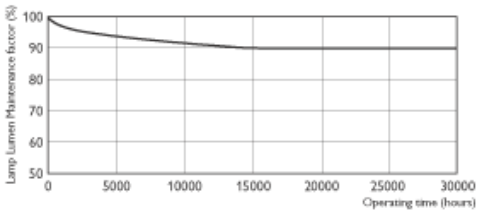
Lightcolor /835

TL5 HO/835

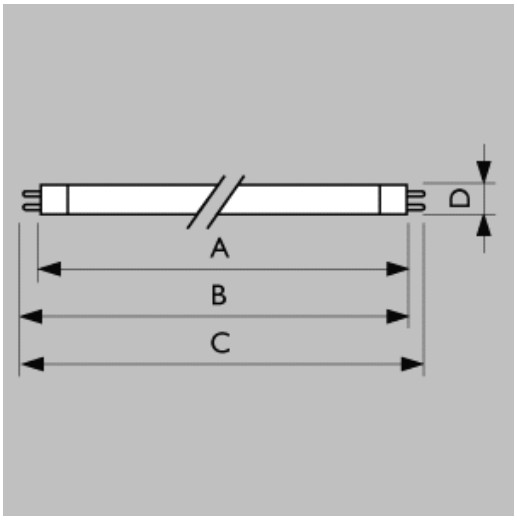


Lightcolor /835

TL5 HO/835



TL5 HO



TL5 HO

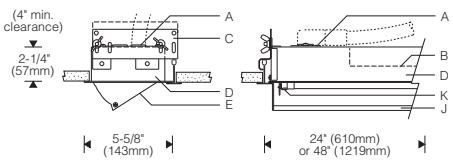
	A	B	B	C	D
Full product name	Max	Min	Max	Max	Max
F54T5 835 HO	1149.0	1153.7	1156.1	1163.2	17

PHILIPS

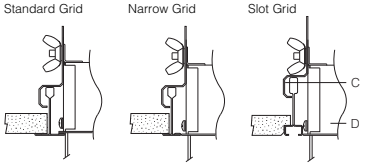
	A	B	B	C	D
Full product name	Max	Min	Max	Max	Max
ALTO TG					

Lighting the Wall
Small semi-recessed adjustable — T5 Fluorescent — **Style 210**

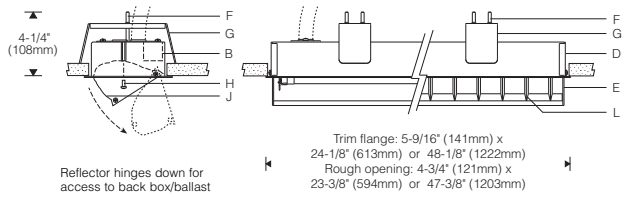
L Mount: Accessible Grid Ceiling
1:8 Scale



Ceiling Compatibility

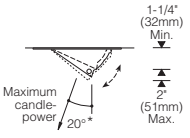


T Mount: Non-Accessible Ceiling



Adjustable Aiming

* Factory preset aiming is 20°. Field adjustable +/- 5°.



Specifications

- **A** Splice access plate with (2) KO's (connector and conduit by others)
- **B** Integral electronic ballast
- **C** Adjustable hanger clamps (grid ceiling)
- **D** Formed aluminum back box with 1/2" flange trim
- **E** Contoured aluminum end plates
- **F** Wing cinching screws
- **G** Wing mounting bracket (non-accessible ceiling)
- **H** Reflector aiming screws
- **J** Specular extruded aluminum reflector
- **K** Miniature bi-pin lampholders
- **L** Accessory snap-in specular parabolic cross baffle, 35° lengthwise shielding

Finish:
Semi-gloss white exterior and trim or bright clear anodized aluminum housing with semi-gloss black end plates and trim.

Painted surfaces - 6 stage pretreatment and electrostatically applied thermoset polyester powder coating for stable, long lasting and corrosion resistant finish.

Reflector - extruded high purity aluminum with clear anodized specular finish. All hardware - stainless steel. Mounting brackets - cold rolled steel with corrosion resistance finish.

Electrical:
Use 90°C wire for supply connections. Splice access plate on top of back box includes two 7/8" diameter conduit entries.

Integral electronic HPF thermally protected class P ballast with end-of-life protection. Optional master/satellite. Master supplied with 2-lamp ballast. Satellite supplied with 10' (3m) leads (conduit by others).

Optional electronic dimming ballast; compatible dimmer switch required (by others). Consult sales representative for compatibility and specifications.

Optional emergency battery - unswitched supply is required.

REV. 7/07

Mounting:
L mount - compatible with most lay-in grid ceilings with T-bar supports 24" (610mm) or 48" (1219mm) on center. Finished trim on long sides supports cut ceiling tile or can rest atop or abut grid.

End hanger clamps with wing nuts for vertical adjustment. Supplemental wire or chain supports (by others) may be required by local codes (weight approx. 10 lb/4.5 kg). Units can be mounted end-to-end in adjacent tiles.

T mount - installs from below non-accessible ceiling. Bracket wings spring outward in plenum and cinch down to ceiling with screws accessible from below. Suitable for ceilings up to 1-1/2" (38mm) thick.

Standard:
UL listed or CSA certified.

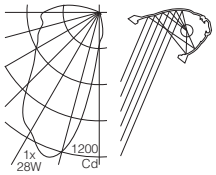
Features

- *Unequaled low energy wall lighting from 2' or 4' T5 lamp*
- *Low profile semi-recessed design - evenly lights entire wall; conceals reflector aperture from normal view*
- *Adjustable - tailor performance to wall height and setback*
- *Compact - ceiling opening less than 6" wide*
- *Available for lay-in grid or non-accessible ceilings*

W 26.0

Performance

Two parabolic reflector sections drive light to the bottom of the wall. An elliptical section shields the lamp from normal viewing angles and redirects its light to a parabola. Glare is minimized and asymmetry of the beam is maximized resulting in high beam efficiency and superior surface uniformity.



For complete photometrics, see www.elliptipar.com.

elliptipar

To Order

Style 210

To form a Catalog Number

F	2	1	0	-	T	155	-	L	-	02	-	2	-	00	0
1		2				3		4		5		6		7	8

Project:

Type:

1 Source

F = Linear fluorescent

2 Style

210 = Small semi-recessed, adjustable, **integral** ballast

3 Lamp

T [ ][ ] = **Lamp Code**

[ ] **Lamp Wattage** (see chart below)

Reflector Configuration, specify **1** or **3** (see chart below)

Example: **T328** = two nominal 4' reflectors, each for use with one 28W T5 lamp; master/satellite ballast combination

Reflector Configuration

1	1 - Lamp Ballast 1-Lamp Reflector
3	2 - Lamp Ballast 1-Lamp Reflector (Master) 1-Lamp Reflector (Satellite)

W 26.1

Lamp Wattage	*Lamp Length*	*Lamp Number*
T5 Fluorescent		
14	2'	F14T5
28	4'	F28T5
T5 HO Fluorescent		
24	2'	F24T5/HO
55	4'	F54T5/HO

For complete lamp and ballast information, see Accessories Section. Standard T5 lamp color is 3000K / 80+ CRI.

4 Mounting

L = Lay-in grid ceiling (for T-bars 24" or 48" on center)
T = Overlapping trim for non-accessible ceilings

5 Finish

02 = Semi-gloss white
81 = Bright clear anodized reflector with semi-gloss black end plates and trim

6 Voltage/Ballast

Electronic	*Dimming**
1 = 120V	**T** = 120V
2 = 277V	**V** = 277V
3 = 347V (Canada)	

* Consult factory for dimming for Reflector Configuration **3**. Dimming availability for wattages and voltages varies with ballast manufacturer and control type - see **www.elliptipar.com** for dimming specifications and limitations

7 Option (See Accessories Section for specifications)

00 = No options
0C = Modified to comply with Chicago plenum code.
0B = Snap-in parabolic cross baffle, specular finish, provides 35° lengthwise shielding
0E = Emergency battery pack with indicator lamp and test button. Integral for 48" units (lamp codes **T128**, **T328**, **T155** and **T355**). **Remote** for 24" units (lamp codes **T114**, **T314**, **T124** and **T324**). Operates one lamp only for master/satellite Configuration 3. **Note:** Requires unswitched feed to battery (by others).
BE = Combination of parabolic cross baffle and emergency battery pack
0Y = Modified to comply with New York City code
XX = For modification not listed, include detailed description. Consult factory prior to specification.

8 Standard

0 = UL, Underwriters Laboratories
J = CSA, Canadian Standards Association

Example

F210 - T128 - L - 02 - 1 - 000

Small semi-recessed model for use with 28W T5 lamp in 4' reflector. For use in lay-in grid ceilings with T-bars spaced at 48" on center. Semi-gloss white. Integral 120V electronic ballast. UL.

Accessories

Order separately. See Accessories Section for specifications.

AFK000X [ ] = Ballast **fuse** kit
0 = UL
J = CSA

REV. 7/07

elliptipar

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114 Boston Post Road, West Haven, Connecticut 06516, USA
Voice 203.931.4455 • Fax 203.931.4464 • **www.elliptipar.com**

EcoSystem Ballasts for linear T5 HO Lamps

Lamp	No. of Lamps	Model	Case Size	Input Voltage (VAC)	Input Current (A)	Input Power (W)	Ballast Factor (BF)	System Lumens (lm)	System Efficacy (lm/W)	Ballast Efficacy Factor	Relative Efficacy (RSE)
F54T5 (45.2 in.)	2	EC5 T554 J UNV 2	J	277 240 120	0.40 0.50 0.99	110.1 119.0 119.3	1.0 1.0 1.0	10,000 10,000 10,000	91 84 84	0.91 0.84 0.84	0.98 0.91 0.91
	1	EC5 T554 J UNV 1	J	277 240 120	0.21 0.24 0.48	56.5 58.0 57.9	1.0 1.0 1.0	5000 5000 5000	88 86 86	1.77 1.73 1.73	0.96 0.93 0.93
F39T5 (33.4 in.)	2	EC5 T539 J UNV 2	J	277 240 120	0.30 0.35 0.70	83.0 84.0 84.3	1.0 1.0 1.0	7000 7000 7000	84 83 83	1.20 1.19 1.19	0.94 0.93 0.93
	1	EC5 T539 J UNV 1	J	277 240 120	0.16 0.18 0.37	43.3 44.0 44.0	1.0 1.0 1.0	3500 3500 3500	81 80 80	2.31 2.27 2.27	0.90 0.89 0.89
F24T5 (21.6 in.)	2	EC5 T524 J UNV 2	J	277 240 120	0.20 0.23 0.45	54.8 54.0 53.9	1.0 1.0 1.0	4000 4000 4000	73 74 74	1.82 1.85 1.86	0.89 0.89 0.89
	1	EC5 T524 J UNV 1	J	277 240 120	0.11 0.12 0.24	30.0 28.8 28.8	1.0 1.0 1.0	2000 2000 2000	67 69 69	3.33 3.47 3.47	0.80 0.83 0.83

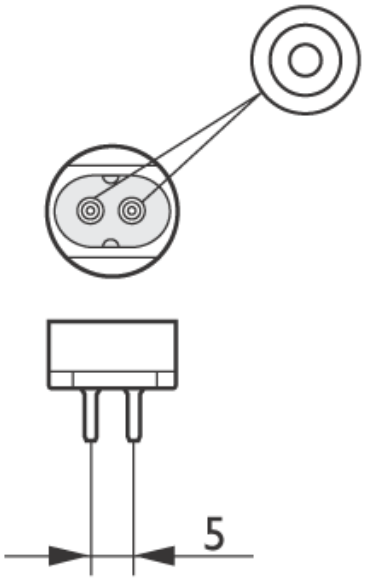
F54T5 835 HO ALTO TG

Product family description

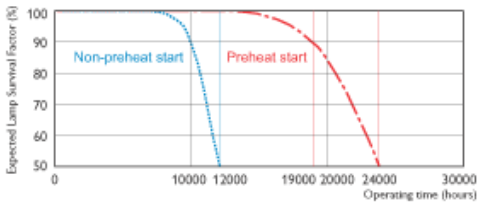
Product data	
Product Number	166728
Full product name	F54T5 835 HO ALTO TG
Ordering Code	F54T5/835/HO/ALTO TG
Pack type	1 Lamp
Pieces per Sku	1
Skus/Case	40
Pack UPC	046677166724
EAN2US	
Case Bar Code	50046677166729
Successor Product number	
System Description	High Output
Base	Miniature Bipin
Base Information	Green [Green Base]
Bulb	T5 [16 mm]
Packing Type	1LP [1 Lamp]
Packing Configuration	40
Rated Avg. Life	24000 hr
Type	F54T5
Feature	ALTO®
Ordering Code	F54T5/835/HO/ALTO TG
Pack UPC	046677166724
Case Bar Code	50046677166729
Watts	54W
Dimmable	Yes
Mercury (Hg) Content	
Color Code	835 [CCT of 3500K]
Color Rendering Index	85 Ra8
Color Designation	835
Color Description	na [-]
Color Temperature	3500 K
Initial Lumens	5000 Lm
Overall Length C	1163.2 mm
Diameter D	17 mm
Product Number	166728

PHILIPS

TL5 HO

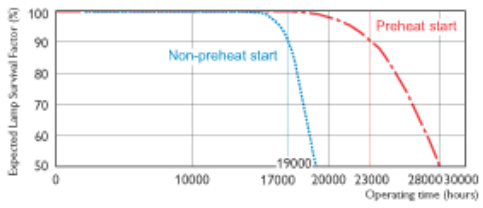


Base Miniature Bipin



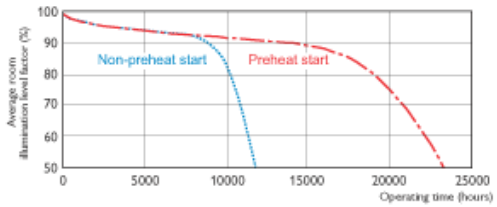
Life Expectancy 3h cycle

TL5 HO



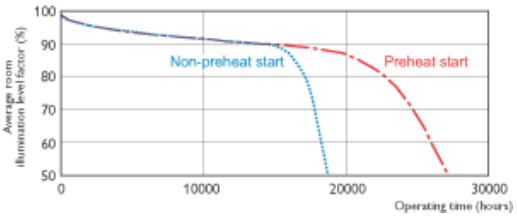
Life Expectancy 12h cycle

TL5 HO



Service Life 3h cycle

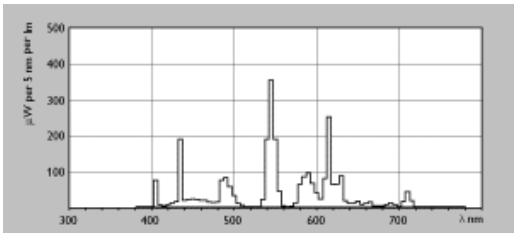
TL5 HO



Service Life 12h cycle

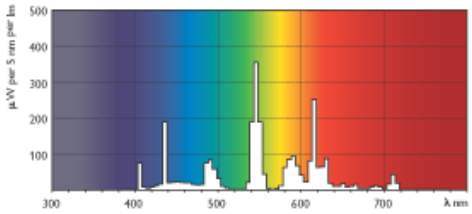
TL5 HO

PHILIPS



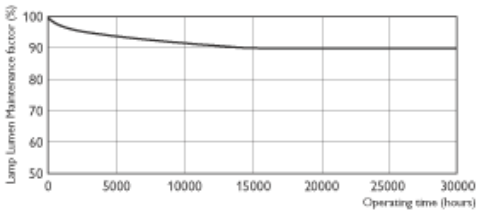
Lightcolor /835

TL5 HO/835

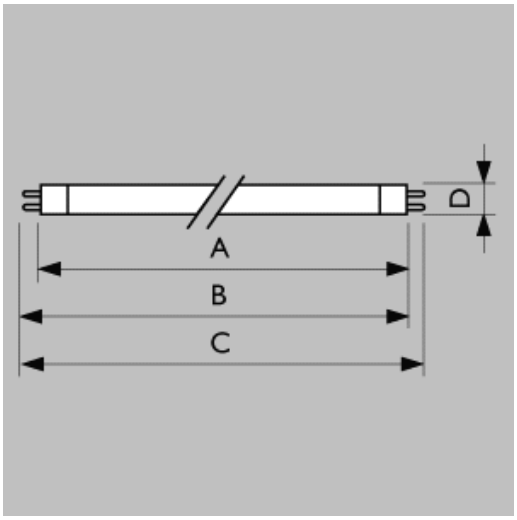


Lightcolor /835

TL5 HO/835



TL5 HO



TL5 HO

	A	B	B	C	D
Full product name	Max	Min	Max	Max	Max
F54T5 835 HO	1149.0	1153.7	1156.1	1163.2	17

PHILIPS

	A	B	B	C	D
Full product name	Max	Min	Max	Max	Max
ALTO TG					

Recessed wall luminaires with asymmetrical distribution

Housings: Die-cast aluminum with integral wiring compartment.

Enclosure: One piece die-cast aluminum faceplate with stepped baffle, ¼" thick, clear tempered glass. Faceplate is screwed by four (4) flush socket head stainless steel captive screws threaded into stainless steel inserts in the housing casting. Continuous high temperature O-ring gasket for weather tight operation. Internal reflector is semi-specular anodized aluminum.

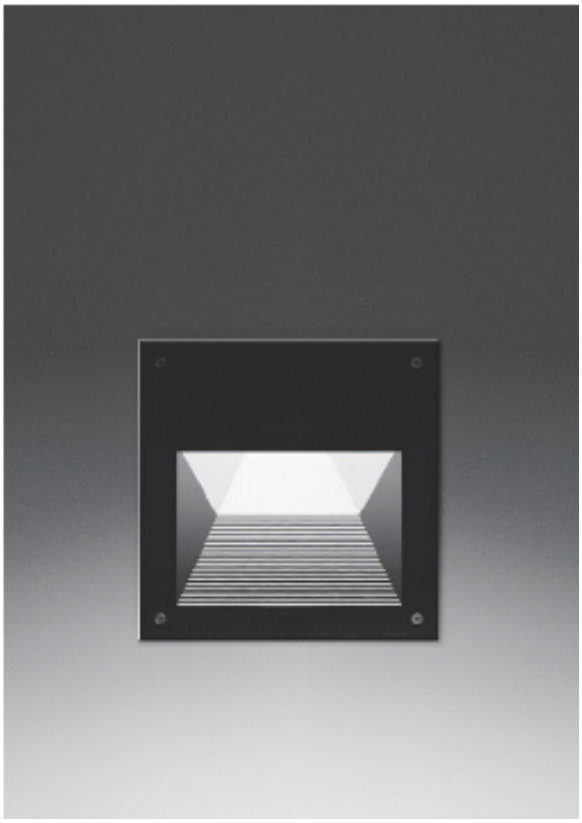
Electrical: Compact fluorescent lampholder: G24q-2 (18W), 4-pin, rated 75 W, 600V. Ballast is electronic, HPF universal voltage (120V through 277 V). Through Wiring: Maximum of four (4) No. 12 AWG conductors (plus ground) suitable for 90°C. Two ¾" knockouts provided for ¾" conduit.

Finish: Available in four standard BEGA colors: Black (BLK); White (WHT); Bronze (BRZ); Silver (SLV). To specify, add appropriate suffix to catalog number. Custom colors supplied on special order.

U.L. listed, suitable for wet locations and for installation within 3 feet of ground. Suitable for all types of construction including poured concrete. Protection class: IP 65.

Note: Standard orientation of fixture is for downwards aiming of light only. For alternate orientations, consult factory.

Type:
BEGA Product:
Project:
Voltage:
Color:
Options:
Modified:



		Lamp		Lumens	A	B	C	CPC*
33481 P		1	18 W CF quad-4p	1260	9¾	9¾	8⅝	8384

CPC: Optional Concrete Protection Cover

BEGA-US 1000 BEGA Way, Carpinteria, CA 93013 (805) 684-0533 FAX (805) 566-9474 www.bega-us.com

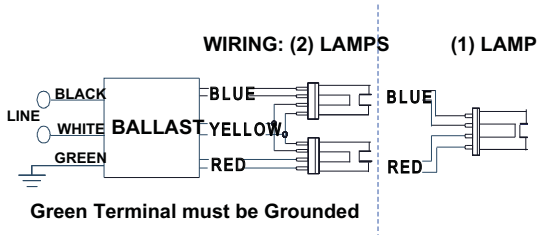
PHILIPS ADVANCE

ICF2S18M1BSQS@120	
Brand Name	SMARTMATE-QS
Ballast Type	Electronic
Starting Method	Rapid Start
Lamp Connection	Series
Input Voltage	120-277
Input Frequency	50/60 HZ
Status	Active

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (ANSI Watts)	Ballast Factor	MAX THD %	Power Factor	MAX Lamp Current Crest Factor	B.E.F.
CFQ18W/G24Q	1	18	0/-18	0.16	19	1.00	10	0.99	1.7	5.26
CFQ18W/G24Q	2	18	0/-18	0.30	35	0.95	10	0.99	1.7	2.71
* CFTR18W/GX24Q	1	18	0/-18	0.17	20	1.05	10	0.99	1.7	5.25
CFTR18W/GX24Q	2	18	0/-18	0.33	39	1.05	10	0.99	1.7	2.69

Wiring Diagram



Green Terminal must be Grounded

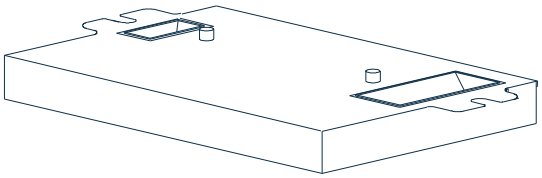
The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

	in.	cm.
Black	0	0
White	0	0
Blue	0	0
Red	0	0
Yellow	0	0
Gray		0
Violet		0

	in.	cm.
Yellow/Blue		0
Blue/White		0
Brown		0
Orange		0
Orange/Black		0
Black/White		0
Red/White		0

Enclosure



Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
4.98 "	2.40 "	0.98 "	2.00 "
4 49/50	2 2/5	0 49/50	2
12.6 cm	6.1 cm	2.5 cm	5.1 cm

Revised 06/24/2008

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10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018
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Customer Support/Technical Service: 800-372-3331 · OEM Support: 866-915-5886

PHILIPS ADVANCE

ICF2S18M1BSQS@120	
Brand Name	SMARTMATE-QS
Ballast Type	Electronic
Starting Method	Rapid Start
Lamp Connection	Series
Input Voltage	120-277
Input Frequency	50/60 HZ
Status	Active

Electrical Specifications

Notes:

Section I - Physical Characteristics

1.1 Ballast shall be physically interchangeable with standard electromagnetic or standard electronic ballasts, where applicable.

1.2 Ballast shall be available in a plastic/metal can or all metal can construction to meet all plenum requirements.

1.3 Ballast shall be provided with poke-in wire trap connectors color coded per ANSI C82.11.

Section II - Performance Requirements

2.1 Ballast shall be Programmed Start except for ballasts with -QS suffix, which shall be Rapid Start.

2.2 Ballast shall contain auto restart circuitry in order to restart lamps without resetting power.

2.3 Ballast shall operate from 50/60 Hz input source of 120V through 277V with sustained variations of +/- 10% (voltage and frequency) with no damage to the IntelliVolt ballast. RCF models shall operate from 60 Hz input source of 120V with sustained variations of +/- 10% (voltage and frequency) with no damage to the ballast.

2.4 Ballast shall be high frequency electronic type and operate lamps at a frequency above 42 kHz to avoid interference with infrared devices and eliminate visible flicker.

2.5 Ballast shall have a Power Factor greater than 0.98 for primary lamp.

2.6 Ballast shall have a minimum ballast factor of 1.00 for primary lamp application.

2.7 Ballast shall provide for a Lamp Current Crest Factor of 1.7 or less in accordance with lamp manufacturer recommendations.

2.8 Ballast input current shall have Total Harmonic Distortion (THD) of less than 10% when operated at nominal line voltage with primary lamp.

2.9 Ballast shall have a Class A sound rating.

2.10 Ballast shall have a minimum starting temperature of -18C (0F) for primary lamp. Ballasts for PL-H lamps shall have a minimum starting temperature of -30C (-20F) for primary lamp.

2.11 Ballast shall provide Lamp EOL Protection Circuit.

2.12 Ballast shall tolerate sustained open circuit and short circuit output conditions without damage.

Section III - Regulatory Requirements

3.1 Ballast shall not contain any Polychlorinated Biphenyl (PCB).

3.2 Ballast shall be Underwriters Laboratories (UL) listed, Class P and Type 1 Outdoor; and Canadian Standards Association (CSA) certified where applicable.

3.3 Ballast shall be rated for use in air-handling spaces.

3.4 Ballast shall comply with ANSI C62.41 Category A for Transient protection.

3.5 Ballast shall comply with ANSI C82.11 where applicable.

3.6 Ballast shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 18, Non-Consumer (Class A) for EMI/RFI (conducted and radiated).

Section IV - Other

4.1 Ballast shall be manufactured in a factory certified to ISO 9002 Quality System Standards.

4.2 Ballast shall carry a five-year warranty from date of manufacture against defects in material or workmanship, including replacement, for operation at a maximum case temperature of 75C and three-years for a maximum case temperature of 85C (90C 3year warranty for ICF1H120-M4-XX, ICF2S42-90C-M2-XX and ICF2S70-M4-XX modesls).

4.3 Manufacturer shall have a fifteen-year history of producing electronic ballasts for the North American market.

4.4 Ballast shall at 120V meet the ballast-controlled performance requirements in the ENERGY STAR Program Requirements for Residential Lite Fixtures.

Revised 06/24/2008

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PL-T 18W/835 GX24q-2 / 4P 1CT

Product family description

PL-T Triple 4pin Fluorescent Lamp with Amalgam.

Features/Benefits

- ALTO® Lamp Technology - Passes EPA's TCLP test for non-hazardous waste.
- Utilizes amalgam technology to provide > 90% of rated lumens in ambient temperatures from 23F to 130F.
- Triple tube design available in 18, 26, 32, and 42W.
- Excellent Color Rendering - 82 Color Rendering Index (CRI).
- Broad Range of Color Temperature - Available in 2700, 3000, 3500 and 4100K.
- Dimmable - PL-T 4-pin lamps may be used with electronic dimming ballasts.
- Long Life - 12,000 hours.
- Energy Saving - Designed for use with electronic ballasts for lower operating costs and flicker-free starting.

Applications

- Ideal for downlights and medium bay multi-lamp fixtures for general lighting.

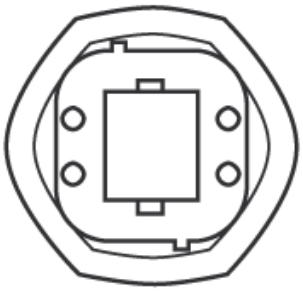
Notes

- Rated average life under specified test conditions with lamps turned off and restarted no more frequently than once every 3 operating hours. Lamp life is appreciably longer if lamps are started less frequently. (202)
- Approximate Initial Lumens. The lamp lumen output is based upon lamp performance after 100 hours of operating life, when the output is measured during operation on a reference ballast under standard laboratory conditions. (203)
- Design Lumens are the approximate lamp lumen output at 40% of the lamp's Rated Average Life. This output is based upon measurements obtained during lamp operation on a reference ballast under standard laboratory conditions. (208)

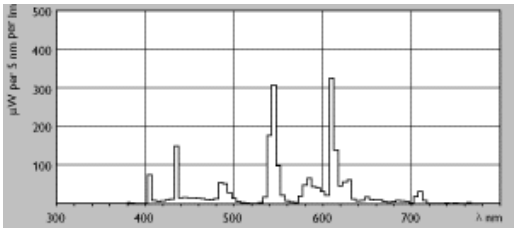
PHILIPS

Product data	
Product Number	268201
Full product name	PL-T 18W/835 GX24q-2 /4P 1CT
Ordering Code	268201
Pack type	1 Lamp in a Folding Carton
Pieces per Sku	1
Skus/Case	12
Pack UPC	046677268206
EAN2US	
Case Bar Code	50046677268201
Successor Product number	
Base	GX24q-2
Base Information	4P
Execution	/4P [4 Pins]
Packing Type	1CT [1 Lamp in a Folding Carton]
Packing Configuration	12
Avg. Hrs. Life	16000 hr
Ordering Code	PL-T 18W/835/4P/ALTO
Pack UPC	046677268206
Case Bar Code	50046677268201
Watts	18W
Lamp Wattage EL	16.5 W
Lamp Voltage	100 V
Dimmable	Yes
Color Code	835 [CCT of 3500K]
Color Rendering Index	82 Ra8
Color Designation	White
Color Description	835 White
Color Temperature	3500 K
Initial Lumens	1200 Lm
Initial Lumens	1130 Lm
Overall Length C	116.4 mm
Diameter D	39.85 mm
Diameter D1	39.65 mm
Product Number	268201

PL-T 18W

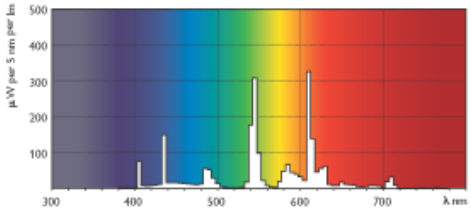


Base GX24q-2



Lightcolor /835

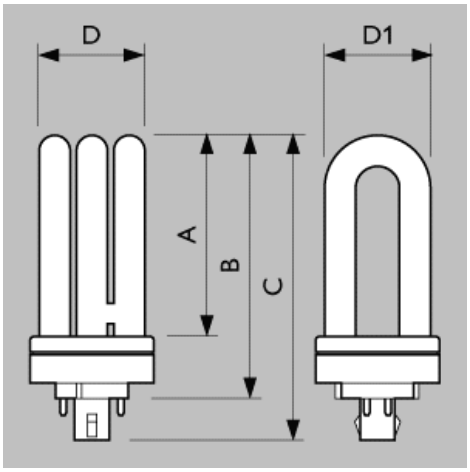
PL-T/835



Lightcolor /835

PL-T/835

PHILIPS

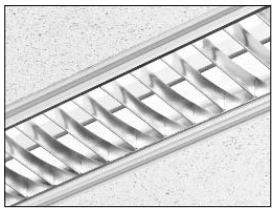


PL-T

	A	B	C	D	D1
Full product name	Max	Max	Max	Max	Max
PL-T 18W/ 835 GX24q-2 /4P 1CT	77	101.5	116.4	39.85	39.65

M100 Recessed Linear Fluorescent Slot Grid / Thick Ceiling Panel

se'lux®



Project: _____ **Type:** _____ **Qty:** _____

M10	– 1T5	– SD	– SG	– 004	– WH	– 277	–
Fixture Series	**Lamp Type**	**Shielding**	**Mounting**	**Nominal Length**	**Finish**	**Voltage**	

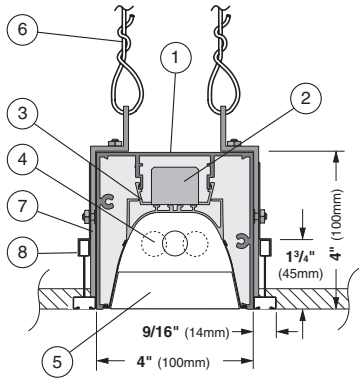
DM – _____ – _____ – _____ – _____ – _____ – _____ – _____ – _____

Options (refer to separate data sheets for ordering codes and details)

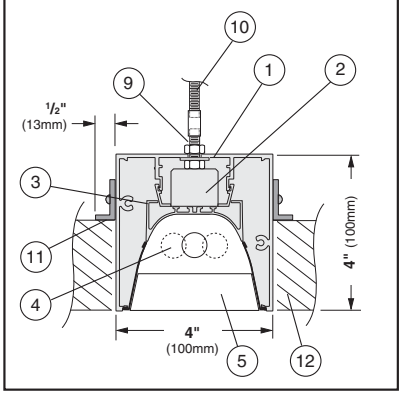
Fixture Series	Lamp Type	Shielding	Mounting	Nominal Length	Finish	Voltage	Options
M10 M100 Recessed Multi-Mount Form	**1T5** F28T5 **2T5** (2x)F28/T5 **1T5HO** F54T5HO **1T8** F032/T8	**SA** Specular Parabolic **MA** Matte Parabolic **MP** Silky Specular Parabolic **PL** Matte Perforated Parabolic **SD** Satine Lens **OD** Extra Diffuse Lens **X** None	**SG** Slot Grid[1] **DC** Ceiling Panels up to 2" thick (lengths per submittal drawings)	**004** 4 foot **008** 8 foot **012** 12 foot For actual lengths see following page. For other lengths, configurations indicate nominal length rounded to the next highest foot. Factory will supply layout drawings. Individual fixtures cannot be field joined.	**WH** White **BK** Black **SV** Silver **SP** Specify RAL#	**120** **277** **347**	(qty.)**EM** Stand-by Battery Pack[2] (prefix quantity, i.e. - **5EM**) **FS** Single Fusing **DM** Dimming[2] (specify system) **DMA** Digital Addressable Dimming[2] **SI** Satine Acrylic Inlay[4] **FW** Flex Whip (standard) **FW1** Flex Whip (dimming) **Track** Eutrac Standard[3] **DL** Suitable for Damp Locations **CCEA** Chicago Plenum **Downlights** (See MR16 spec sheets, pp.98-99)

[1]T5 & T5HO lamps only, consult factory for other lamps. [2]Must be low profile ballasts (1½" W x 1 3/16" H); consult factory for details. [3]Consult factory for details. [4]SA, MA, MP & PL shieldings only.

Slot Grid (SG) Scale = 1 : 4



Ceiling Panels up to 2" thick (DC) Scale = 1 : 4



1. Housing - Continuous, 6063-T5 extruded aluminum profile up to 16 feet long. Joined with Connector Plus Joining System for ease of installation and to assure a uniform appearance.

2. Ballast - Electronic, high power factor, class "P", type "A" sound rating. Specify 120v, 277v, or 347v. Ballast is factory pre-wired with leads to one end of fixture. Consult factory for ballast options.

3. Gear Tray - Extruded aluminum,with white painted finish. Gear tray installed as a complete electrical unit and is held in place with knurled dress nuts. It is fully accessible from below ceiling.

4. Lamps - As noted (by others). Other lamp lengths or wattages available, consult factory.

5. Shielding - Louvers offer excellent glare control in longitudinal, lateral, and all diagonal planes. High quality aluminum louvers and acrylic shielding allow true freedom of layout for today's modern spaces.

6. Support wire to structure - Supplied and installed by others.

7. Support bracket - Supplied nominally every four feet.

8. Slot grid beam and cross tees - Supplied and installed by others.

9. Pre-installed 1" 1/4-20 Stud - Attached to fixture every nominal 4 feet.

10. Coupling and Threaded Rod to Structure - Supplied and installed by others.

11. Aluminum angle brackets - Run entire length of fixture to block view into plenum area from below fixture.

12. Ceiling Panels up to 2" thick - Supplied and installed by others. Suitable for Decoustic® ceiling panel installations. Other ceiling systems possible, please consult factory. Decoustic® is a registered trademark of Decoustics Ltd. Corporation.

Interior Luminaire Finish - Standard interior colors are White (WH), Black (BK) and Silver (SV). RAL colors (SP) are available, please

TEL: (845) 691-7723
FAX: (845) 691-6749
www.selux.com/usa
M10_SG-01 (v5.0)

c UL us LISTED
Union Made Affiliated with **IBEW** *Local 363*

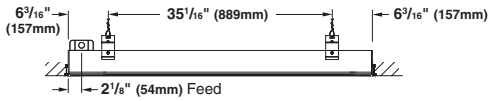
M100 Recessed Linear Fluorescent Slot Grid / Thick Ceiling Panel

M10 Slot Grid Layout Dimensions

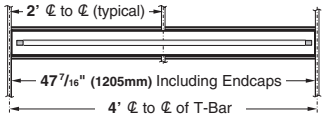
For T5 and T5HO lamps only, for other lamping consult factory.

Nominal 4 foot Individual

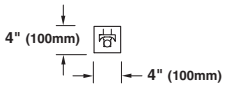
Side View



Bottom View

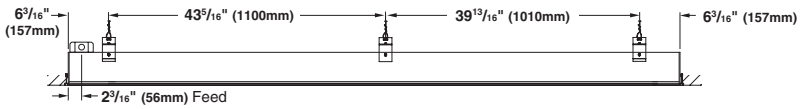


Typical End View (all lengths)

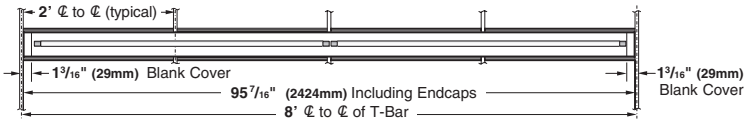


Nominal 8 foot Individual

Side View

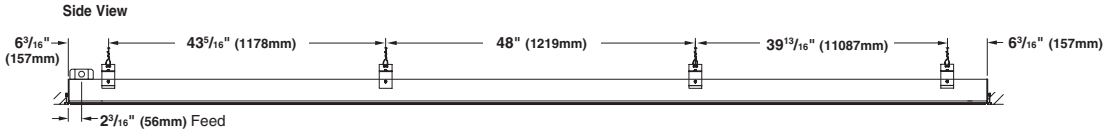


Bottom View

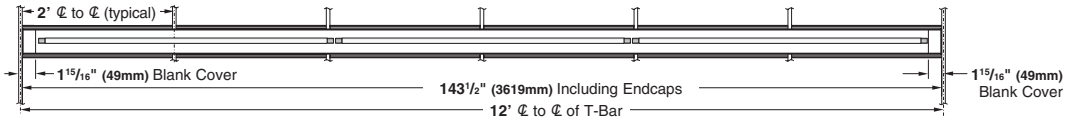


Nominal 12 foot Individual

Side View



Bottom View



Fixture supplied with 7/8 knockout located 2 3/16" from end in top of fixture.

For other lengths, lamping, continuous runs or configurations please specify overall length (in feet), accessories desired and sketch/drawing of configuration. SELUX will detail project drawings upon order and supply submittal drawings for approval. Individual fixtures cannot be field joined. If you have any questions please contact SELUX customer service or applications engineering for assistance (1-800-SELUX-CS).

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TEL: (845) 691-7723 / FAX: (845) 691-6749
E-mail: seluxus@selux.com / Web Site: www.selux.com/usa
M10_SG-02 (02/06)

EcoSystem Ballasts for linear T5 Lamps

Lamp	No. of	Model	Case Size	Input Voltage (VAC)	Input Current (A)	Input Power (W)	Ballast Factor (BF)	System Lumens (lm)	System Efficacy (lm/W)	Ballast Efficacy Factor	Relative Efficacy (RSE)
F35T5 (57.1 in.)	1	EC5 T535 J UNV 1	J	277 240 120	0.15 0.18 0.35	42.0 42.3 42.2	1.0 1.0 1.0	3650 3650 3650	87 87 87	2.38 2.38 2.38	0.83 0.83 0.83
F28T5 (45.2 in.)	2	EC5 T528 J UNV 2	J	277 240 120	0.23 0.27 0.54	64.5 65.0 65.2	1.0 1.0 1.0	5800 5800 5800	90 89 89	1.55 1.54 1.53	0.87 0.86 0.86
	1	EC5 T528 J UNV 1	J	277 240 120	0.12 0.14 0.27	32.6 32.9 32.9	1.0 1.0 1.0	2900 2900 2900	89 88 88	3.07 3.04 3.04	0.86 0.85 0.85
F21T5 (33.4 in.)	2	EC5 T521 J UNV 2	J	277 240 120	0.17 0.20 0.39	46.0 47.2 47.2	1.0 1.0 1.0	4200 4200 4200	91 89 89	2.17 2.12 2.12	0.91 0.89 0.89
	1	EC5 T521 J UNV 1	J	277 240 120	0.09 0.11 0.22	25.8 25.8 25.8	1.0 1.0 1.0	2100 2100 2100	81 81 81	3.88 3.88 3.88	0.81 0.81 0.81
F14T5 (21.6 in.)	2	EC5 T514 J UNV 2	J	277 240 120	0.12 0.14 0.28	32.8 33.3 33.3	1.0 1.0 1.0	2700 2700 2700	82 81 81	3.05 3.00 3.00	0.85 0.85 0.85
	1	EC5 T514 J UNV 1	J	277 240 120	0.07 0.08 0.16	19.0 19.2 19.2	1.0 1.0 1.0	1350 1350 1350	71 70 70	5.26 5.21 5.21	0.74 0.74 0.74

LUTRON® SPECIFICATION SUBMITTAL Page 4

Job Name:	Model Numbers:	
Job Number:		

28W/835 Min Bipin T5 HE ALTO UNP

Product family description

High efficiency, environmentally responsible, ultra-slim lamps.

Features/Benefits

- Slim profile lamp and ballast.
- Better for the environment.
- Operates on programmed start ballasts.
- Fail-safe operation at end of life.
- Design flexibility.
- Improved optical control.
- Fixtures can be 40% smaller than T8 systems.
- Better fit in 2 x 2 and 2 x 4 grid ceilings.
- Low mercury (14W, 21W and 28W.)
- Energy efficient.
- Less material for less waste.

Applications

- Ideal for general, decorative and architectural lighting in offices, retail stores, hotels, schools and hospitals.

Notes

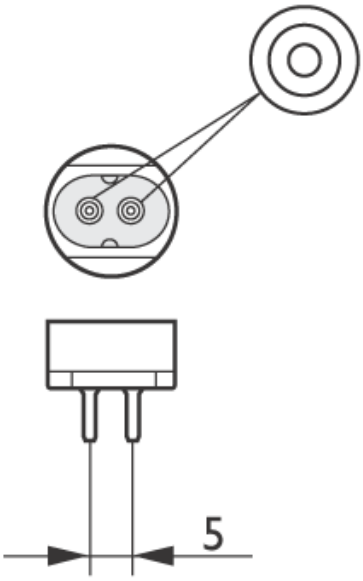
- Silhouette™ T5 nominal lamp lengths are shorter than standard sizes. See dimension chart for details.

Product data	
Product Number	230854
Full product name	28W/835 Min Bipin T5 HE ALTO UNP
Ordering Code	230854
Pack type	Unpacked
Pieces per Sku	1
Skus/Case	40
Pack UPC	046677230852
EAN2US	
Case Bar Code	50046677230857
Successor Product number	
System Description	High Efficiency
Base	Miniature Bipin
Base Information	Green [Green Base]
Bulb	T5 [16 mm]

PHILIPS

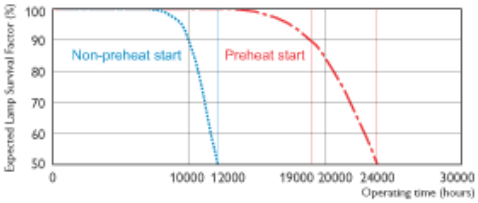
Product data	
Packing Type	UNP [Unpacked]
Packing Configuration	40
Rated Avg. Life	24000 hr
Type	na
Feature	na [Not Applicable]
Ordering Code	F28T5/835/ALTO
Pack UPC	046677230852
Case Bar Code	50046677230857
Watts	28W
Dimmable	Yes
Color Code	835 [CCT of 3500K]
Color Rendering Index	82 Ra8
Color Designation	White
Color Description	835 White
Color Temperature	3500 K
Initial Lumens	2900 Lm
Overall Length C	1163.2 mm
Diameter D	17 mm
Special packing	ALTO
Product Number	230854

TL5 HE



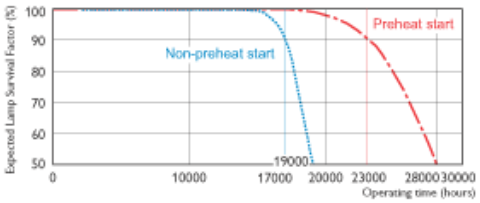
Base Miniature Bipin

PHILIPS



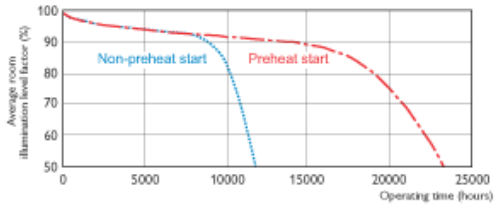
Life Expectancy 3h cycle

TL5 HE



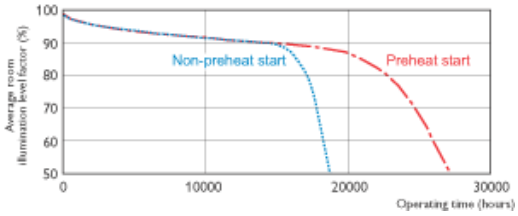
Life Expectancy 12h cycle

TL5 HE



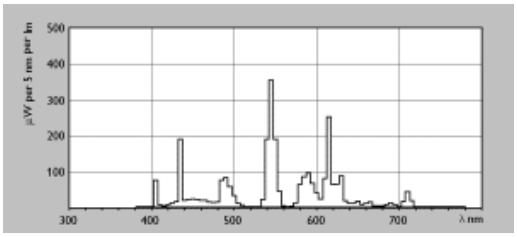
Service Life 3h cycle

TL5 HE



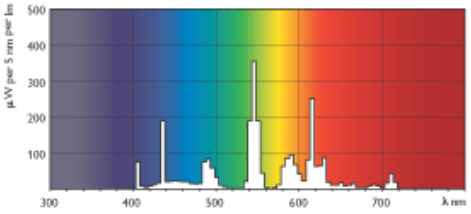
Service Life 12h cycle

TL5 HE



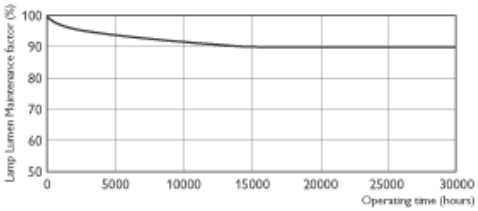
Lightcolor /835

TL5 HE/835

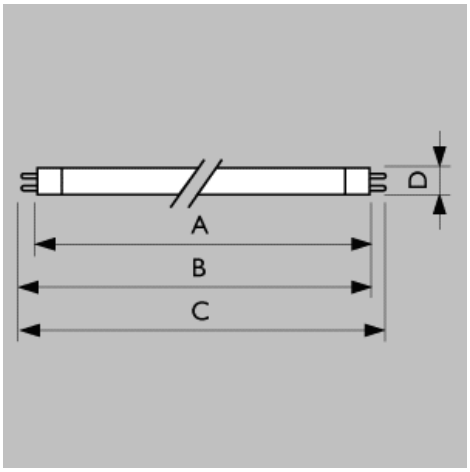


Lightcolor /835

TL5 HE/835



TL5 HE



TL5 HE

	A	B	B	C	D
Full product name	Max	Min	Max	Max	Max
28W/ 835 Min Bipin T5 HE ALTO UNP	1149.0	1153.7	1156.1	1163.2	17

See attached Lighting Fixture Schedule

Date: _____ Type: _____

Firm Name: _____

Project: _____

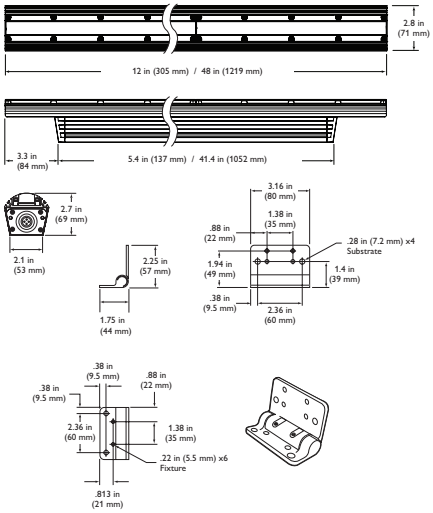
eW Graze Powercore

2700 K, 10° x 60° Lens

Linear, LED surface light for wall washing and grazing

eW® Graze Powercore is a linear lighting fixture optimized for surface grazing and wall-washing applications requiring high-quality white or solid color light. Featuring Powercore® technology, eW Graze Powercore processes power directly from line voltage, eliminating the need for low-voltage, external power supplies. Fixtures are available in eight color temperatures, ranging from a warm 2700 K to a cool 6500 K, and five solid colors. eW Graze Powercore offers superior illumination quality and dramatic energy savings for new installations and retrofit upgrades. A space-efficient, low-profile aluminum housing and flexible mounting options allow discrete placement within a wide range of compact architectural details

- Tailor light output to specific applications — eW Graze Powercore is available in standard 1 ft and 4 ft exterior-rated housings, and standard 10° x 60° and 30° x 60° beam angles.
- High-performance illumination and beam quality — eW Graze Powercore offers superior beam quality for striation-free saturation as close as 6 in (152 mm) from fixture placement. eW Graze Powercore accommodates end-to-end or incremental placement without visible light scalloping between fixtures.
- Supports new applications for white light— Long-life LEDs (50,000 hours at 70% lumen maintenance) significantly reduce or eliminate maintenance problems, allowing the use of white or solid color lighting in spaces where bulb maintenance may be limited or unfeasible.
- Universal power input range — eW Graze Powercore accepts line voltage input of 100, 120, 220 – 240, and 277 VAC.
- Versatile installation options — Constant torque locking hinges offer simple position control from various angles without special tools. The low-profile extruded aluminum housing accommodates installation within architectural niches of many different shapes and sizes.



- Wide range of build-to-order configurations — Additional fixture lengths, beam angles, color temperatures up to 6500 K, and solid colors (Royal Blue, Blue, Green. Amber, and Red) are available as build-to-order configurations. See the eW Graze Powercore Ordering Information sheet for complete details.
- "Cool lighting" functionality — eW Graze Powercore fixtures do not heat illuminated surfaces, discharge infrared radiation or emit ultraviolet light.
- Dimming capable — Patented DIMand™ technology offers smooth dimming capability with many ELV-type dimmers.
- Trouble-free, code-compliant installation — IP66, UL wet location ratings. UL / cUL, CE, FCC, RoHS, WEEE certified.

For detailed product information, please refer to the eW Graze Powercore Product Guide at www.colorkinetics.com/ls/essentialwhite/ewgraze/

A Green Flagship Product

Our Green Flagship Products offer significantly improved environmental performance in two or more of the following Green Focal Areas: weight, energy consumption, hazardous substances, packaging, recycling, disposal, and lifetime reliability.

PHILIPS

Specifications

Due to continuous improvements and innovations, specifications may change without notice.

Item	Specification	1 ft (305 mm)	4 ft (1.2 m)
Output	Beam Angle	10° x 60°	
	Color Temperature	2700 K (+375 / -300)	
	Lumens†	404	1616
	Efficacy (Lm/W)	26.9	
	Mixing Distance	6 in (152 mm) to uniform beam saturation	
	Lumen Maintenance‡	100,000+ hours L_{70} @ 25° C 50,000 hours L_{70} @ 50° C	
Electrical	Input Voltage	100 / 120 / 220 – 240 / 277 VAC, 50 / 60 Hz	
	Power Consumption	15 W maximum at full output, steady state	60 W maximum at full output, steady state
Control		Commercially available ELV control dimmers	
Physical	Dimensions *(Height x Width x Depth)*	2.7 x 12 x 2.8 in (69 x 305 x 71 mm)	2.7 x 48 x 2.8 in (69 x 1219 x 71 mm)
	Weight	2.7 lb (1.2 kg)	10.8 lb (4.9 kg)
	Housing	Extruded anodized aluminum	
	Lens	Clear polycarbonate	
	Fixture Connectors	Integral male / female waterproof connectors	
	Mounting	Multi-positional, constant torque locking hinges	
	Temperature	-40° – 122° F (-40° – 50° C) Operating -4° – 122° F (-20° – 50° C) Startup	
	Humidity	0 – 95%, non-condensing	
	Fixture Run Lengths*	88 @ 110 VAC 97 @ 20 VAC 180 @ 220 VAC 197 @ 240 VAC	*Configuration:* *1 ft (305 mm) fixtures installed end-to-end, 20 A circuit, standard 50 ft (15.2 m) Leader Cable*
Certification and Safety	Certification	UL / cUL, FCC Class A, CE, RoHS, WEEE	
	LED Class	Class 2 LED product	
	Environment	Dry / Damp / Wet Location, IP66	

† Lumen measurement complies with IES LM-79-08.

‡ L_{70} = 70% maintenance of lumen output. (When light output drops below 70% of initial output.)

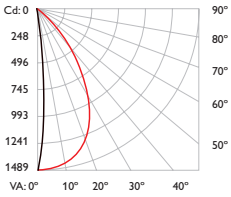
* These figures, provided as a guideline, are accurate for this configuration only. Changing the configuration can affect the fixture run lengths.

OPTIBIN® CKTECHNOLOGY | POWERCORE® CKTECHNOLOGY | DIMAND® CKTECHNOLOGY

Photometrics

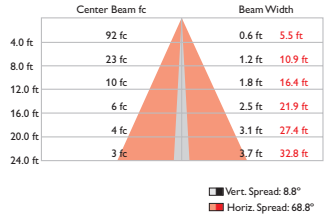
2700 K, 1 ft, 10° x 60° lens

Polar Candela Distribution



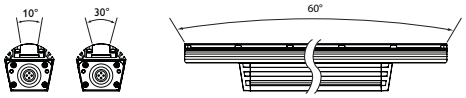
	0	22.5	44	67.5	90
0	1478	1478	1478	1478	1478
5	617	679	880	1235	1478
15	80	88	131	460	1384
25	37	43	61	139	1140
35	22	25	36	67	715
45	11	12	23	43	271
55	4	5	12	27	70
65	1	2	6	13	25
75	1	1	1	5	9
85	1	0	0	1	1
90	0	0	0	0	0

Illuminance at Distance



For lux multiply fc by 10.7

Power Consumption	15 W
Lumens	404
Efficacy	26.9 Lm/W



Fixtures

Item	Beam Angle	Voltage	Size	Item Number	Philips 12NC
eW Graze Powercore 2700 K	10° x 60°	120 VAC	1 ft	523-000030-00	910503700276
			4 ft	523-000030-02	910503700278
		277 VAC	1 ft	523-000030-08	910503700284
			4 ft	523-000030-10	910503700286
		220 – 240 VAC	1 ft	523-000030-16	910503700292
			4 ft	523-000030-18	910503700294
		100 VAC	1 ft	523-000030-24	910503700300
			4 ft	523-000030-26	910503700302

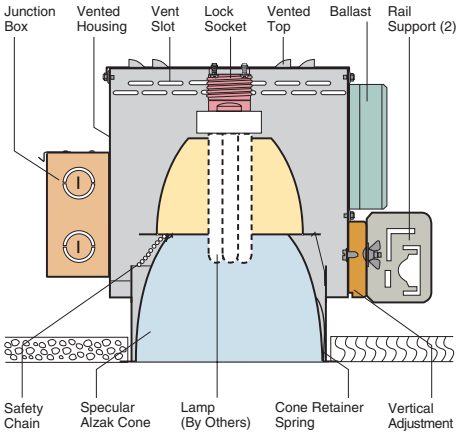
Use Item Number when ordering in North America.

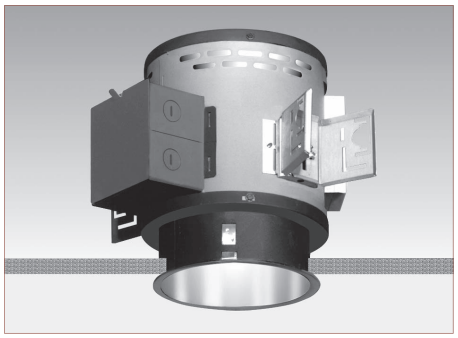
Accessories

Item	Type	Size	Item Number	Philips 12NC
Leader Cable	UL / cUL	50 ft (15.2 m)	108-000041-00	910503700320
	CE		108-000041-01	910503700320
Jumper Cable	UL / cUL	End-to-End	108-000039-00	910503700314
		1 ft (305 mm)	108-000039-01	910503700315
		5 ft (1.5 m)	108-000039-02	910503700316
	CE	End-to-End	108-000040-00	910503700317
		1 ft (305 mm)	108-000040-01	910503700318
		5 ft (1.5 m)	108-000040-02	910503700319
Glare Shield		1 ft (305 mm)	120-000081-00	910503700745
		2 ft (610 mm)	120-000081-01	910503700746
		3 ft (914 mm)	120-000081-02	910503700747
		4 ft (1.2 m)	120-000081-03	910503700748

Philips Color Kinetics
3 Burlington Woods Drive
Burlington, Massachusetts 01803 USA
Tel 888.385.5742
Tel 617.423.9999
Fax 617.423.9998
www.colorkinetics.com

DAS-000009-01 R04 07-09





P926 One 26W or 32W Triple Tube Lamp
P927 One 42W Triple Tube Lamp

Medium Beam
5 7/8" Conoid Apertures

Optics and Applications
Distribution from a single vertically mounted triple tube lamp is for general lighting. Spacing to mounting height ratios range from .93 to 1.11 depending upon which lamp is mounted. Use in corridors, entries, work stations or open area lighting in low to medium height ceilings.

Design Features
The two reflector optical system is protected by a rigid steel housing which keeps the reflectors in proper relationship to each other. The twist and lock socket prevents the lamp from falling if it is not properly engaged. It is a dependable fail-safe mechanism to prevent injury and litigation. Maximum ceiling thickness is 2". Ballast and lamp service from below.

Finish
Specular clear Alzak cones are standard. Optional colors and Softglow® finishes are available. Housings and structural parts are painted optical matte black to suppress stray light leaks. Steel parts are phosphate conditioned for corrosion resistance before painting.

Ballasts
Fully electronic, microprocessor controlled with variable starting current for inrush protection to assure rated lamp life. Input voltage ranges from 120V through 277V. Power factor .98, starting temperature 0° F (-18° C), THD < 10%. Pre-heat start < 1.0 second. End of lamp life protection. Rated for > 50,000 starts.

General
Fixtures are pre-wired, UL and C-UL listed for eight wire 75°C branch circuit wiring. Union made IBEW. Luminaire Efficiency Rating (LER) data is in the photometric directory located in Section Z.

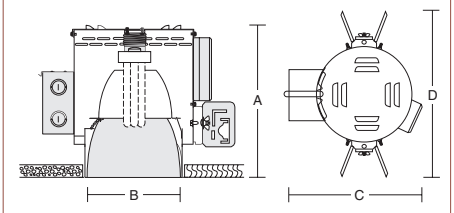
Accessories

G	Gold cone.	R2	26" support rails.
H	Mocha cone.	R5	52" support rails.
P	Graphite cone.	WT	White trim flange.
T	Titanium cone.	WHT	White complete trim.
W	Wheat cone.	V347	347 volt ballast.
Y	Pewter cone.	F	Fuse.
Z	Bronze cone.		

S Softglow® finishes: add S before color letters. e.g. SW for Softglow® wheat cone, SC for Softglow® clear cone.
DM Dimming ballast. Specify watts and volts.
EM Emergency power includes integral charger light and test switch visible through aperture. Single lamp operation for 90 minutes. Specify volts.
WRL Wattage restriction label, specify wattage.

Matching Units
Medium wide beam Page P52
Wall washers Pages P61, P62, P63

Dimensions and Lamps



Number	A Depth*	B Aperture	C Width	D Length	Lamps
P926	9 3/4" 248mm	5 7/8" 149mm	10 1/2" 267mm	13 1/4" 337mm	26W or 32W Triple Tube
P927	10 1/4" 260mm	5 7/8" 149mm	10 1/2" 267mm	13 1/4" 337mm	42W Triple Tube

*Recess depth increases to 12 1/2" with EM and DM accessories.

kurt versen
Kurt Versen Company Point Source Lighting
Westwood, New Jersey 07675

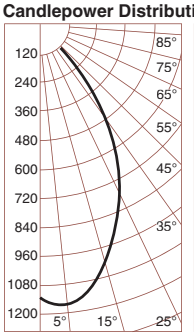
P51 P926 P927

Performance Datachart

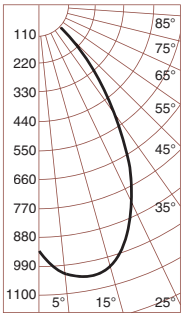
Single Unit Initial Footcandles, 30" Work Plane							Ceiling to Floor	Multiple Units Initial Footcandles, 30" Work Plane			
P926 One 32W Osram Triple Tube Read Top Data P927 One 42W Osram Triple Tube Read Bottom Data								Ceiling 80% Walls 50% Floor 20%			
Nadir	10°		20°		30°			Spacing is Maximum Over Work Plane			
FC	FC	Diam	FC	Diam	FC	Diam		Spacing	RCR 1	RCR 3	RCR 8
37 47	35 42	2' 2'	25 30	4' 4'	13 17	6' 6'	8'	5' 5'	49 66	42 56	30 39
27 33	25 30	2' 2'	18 21	5' 5'	10 12	8' 8'	9'	6' 6'	35 47	30 40	21 28
20 25	19 23	3' 3'	14 16	5' 5'	7 9	9' 9'	10'	7' 7'	26 36	23 30	16 21
13 16	12 14	3' 3'	8 10	7' 7'	4 6	11' 11'	12'	9' 9'	17 22	14 19	10 13
9 11	8 10	4' 4'	6 7	8' 8'	3 4	13' 13'	14'	11' 11'	11 15	10 13	7 9

See notes 4, 5 and 6.

Candlepower Distribution



P926 32W Triple Tube Osram
Eff. 50% S/M .95



P926 32W Triple Tube Philips
Eff. 50% S/M 1.11

Candelas

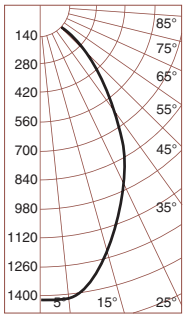
o	O 32W	P 32W
	2400*	2400*
0	1134	938
5	1152	1021
10	1109	1055
15	1023	1020
20	916	956
25	789	837
30	625	667
35	460	467
40	353	321
45	212	173
50	19	16
55	7	6
60	0	0
65	0	0
70	0	0
75	0	0
80	0	0
85	0	0
90	0	0

° Vertical Angles
* Initial Lamp Lumens

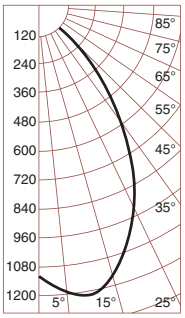
Coefficients of Utilization

Ceiling	80%				70%		50%		30%		0
Wall %	70	50	30	10	50	10	50	10	50	10	0
RCR	Zonal Cavity Method - Floor Reflectance 20%										
1	.57	.56	.55	.53	.55	.52	.53	.51	.51	.49	.47
2	.54	.52	.50	.48	.51	.47	.49	.46	.48	.45	.43
3	.51	.48	.45	.43	.47	.43	.46	.42	.45	.41	.40
4	.48	.44	.41	.39	.44	.39	.43	.38	.42	.38	.37
5	.46	.41	.38	.36	.41	.36	.40	.35	.39	.35	.34
6	.43	.38	.35	.33	.38	.33	.37	.33	.36	.32	.31
7	.41	.36	.33	.30	.35	.30	.35	.30	.34	.30	.29
8	.39	.34	.30	.28	.33	.28	.33	.28	.32	.28	.27
9	.37	.31	.28	.26	.31	.26	.31	.26	.30	.26	.25
10	.35	.30	.26	.24	.29	.24	.29	.24	.28	.24	.23

P926 One 32W Triple Tube Osram Sylvania
P926 One 32W Triple Tube Philips x .98



P927 42W Triple Tube Osram
Eff. 48% S/M .93



P927 42W Triple Tube Philips
Eff. 44% S/M 1.07

o	O 42W	P 42W
	3200*	3200*
0	1412	1104
5	1403	1188
10	1328	1211
15	1176	1154
20	1092	1063
25	958	919
30	789	747
35	611	583
40	487	441
45	355	253
50	75	23
55	10	8
60	0	0
65	0	0
70	0	0
75	0	0
80	0	0
85	0	0
90	0	0

° Vertical Angles
* Initial Lamp Lumens

Ceiling	80%				70%		50%		30%		0
Wall %	70	50	30	10	50	10	50	10	50	10	0
RCR	Zonal Cavity Method - Floor Reflectance 20%										
1	.56	.55	.54	.53	.54	.52	.52	.50	.50	.49	.46
2	.53	.51	.49	.47	.50	.47	.48	.46	.47	.45	.43
3	.51	.47	.45	.43	.47	.42	.45	.42	.44	.41	.39
4	.48	.44	.41	.39	.43	.38	.42	.38	.41	.38	.36
5	.45	.41	.38	.35	.40	.35	.39	.35	.39	.35	.34
6	.43	.38	.35	.33	.38	.32	.37	.32	.36	.32	.31
7	.40	.35	.32	.30	.35	.30	.34	.30	.34	.30	.29
8	.38	.33	.30	.28	.33	.28	.32	.28	.32	.27	.27
9	.36	.31	.28	.26	.31	.26	.30	.26	.30	.26	.25
10	.34	.29	.26	.24	.29	.24	.29	.24	.28	.24	.23

P927 One 42W Triple Tube Osram Sylvania
P927 One 42W Triple Tube Philips x .89

Brightness

Number	Lamps	85°	75°	65°	55°	45°
P926	32W Osram Sylvania Triple Tube	10	33	66	150	12837
	32W Philips Triple Tube	12	34	62	151	10756
P927	42W Osram Sylvania Triple Tube	14	45	91	208	17796
	42W Philips Triple Tube	15	45	82	203	14468

Data in footlamberts. Photometer readings, Maximum Brightness Method. See note 7.

Notes

1 Data on all charts calculated with a clear specular cone finish.
2 Specular cone multipliers: Wheat x .84, Pewter x .79, Mocha x .78, Graphite x .75, Titanium x .75, Bronze x .72.
3 Softglow® cone multipliers: Wheat x .71, Mocha x .68, Pewter x .65, Graphite x .64, Titanium x .64, Bronze x .61.
4 Single unit Datachart pattern diameters are determined by the number of degrees from each side of nadir. Therefore a 20° diameter represents a total 40° pattern width at the work plane 30" above the floor. Footcandle values are at the edge of that diameter.
5 Datachart spacing is rounded off to the nearest foot.
6 Data by IES methods. Compact fluorescent data vary due to lamp differences, power input, burning position, ambient temperature and ballast characteristics. Apply a modification factor.
7 Brightness data from the Average Luminance Method are inaccurate for small aperture downlights. They are theoretical calculations derived for large surfaces such as troffers. For a complete discussion refer to section Z brochure Z1.

Kurt Versen Company, Westwood, New Jersey

EcoSystem Compact Fluorescent Ballast Models

Lamp Type	Lamp Watts	No. of Lamps	Model	Case Size	Input Voltage (VAC)	Input Current (A)	Input Power (W)	Ballast Factor (BF)	System Lumens (lm)	System Efficacy (lm/W)	Ballast Efficacy Factor	Relative Efficacy (RSE)
T4 4-Pin Quad-Tube or Triple-Tube 	18 W	1	EC3DT418KU1S (Studded)	K	120	0.180	21.3	0.95	1140	53.5	4.46	0.80
				K	220	0.098	21.1	0.95	1140	54.0	4.50	0.81
			EC3DT418KU1 (Non-studded)	K	240	0.092	21.4	0.95	1140	53.3	4.44	0.80
				K	277	0.080	20.8	0.95	1140	54.8	4.57	0.82
		2	EC3DT418KU2S (Studded)	K	120	0.34	41.1	0.95	2280	55.5	2.31	0.83
				K	220	0.18	39.6	0.95	2280	57.6	2.40	0.86
			EC3DT418KU2 (Non-studded)	K	240	0.17	39.4	0.95	2280	57.9	2.41	0.87
				K	277	0.15	39.9	0.95	2280	57.1	2.38	0.86
	26 W	1	EC3DT4MWKU1S (Studded)	K	120	0.22	26.4	0.95	1710	64.8	3.60	0.94
				K	220	0.12	26.8	0.95	1710	63.9	3.55	0.92
			EC3DT4MWKU1 (Non-studded)	K	240	0.11	26.9	0.95	1710	63.7	3.54	0.92
				K	277	0.10	27.0	0.95	1710	63.4	3.52	0.92
		2	EC3DT4MWKU2S (Studded)	K	120	0.43	51.6	0.95	3420	66.3	1.84	0.96
				K	220	0.23	49.9	0.95	3420	68.5	1.90	0.99
			EC3DT4MWKU2 (Non-studded)	K	240	0.21	50.6	0.95	3420	67.5	1.88	0.98
				K	277	0.19	51.4	0.95	3420	66.6	1.85	0.96
T4 4-Pin Triple-Tube 	32 W	1	EC3DT4MWKU1S (Studded)	K	120	0.27	32.4	0.95	2280	70.4	2.93	0.94
				K	220	0.14	31.6	0.95	2280	72.1	3.00	0.96
			EC3DT4MWKU1 (Non-studded)	K	240	0.13	31.7	0.95	2280	72.0	3.00	0.96
				K	277	0.11	31.7	0.95	2280	71.9	3.00	0.96
		2	EC3DT4MWKU2S (Studded)	K	120	0.55	66.0	0.95	4560	69.1	1.44	0.92
				K	220	0.29	64.5	0.95	4560	70.7	1.47	0.94
			EC3DT4MWKU2 (Non-studded)	K	240	0.26	63.0	0.95	4560	72.3	1.51	0.96
				K	277	0.24	65.5	0.95	4560	69.7	1.45	0.93
	42 W	1	EC3DT442KU1S (Studded)	K	120	0.36	43.2	0.95	3040	70.4	2.20	0.92
				K	220	0.20	42.9	0.95	3040	70.8	2.21	0.93
			EC3DT442KU1 (Non-studded)	K	240	0.18	42.7	0.95	3040	71.2	2.23	0.93
				K	277	0.15	42.6	0.95	3040	71.3	2.23	0.94
		2	EC3DT442KU2S (Studded)	K	120	0.73	87.6	0.95	6080	69.4	1.08	0.91
				K	220	0.39	85.9	0.95	6080	70.8	1.11	0.93
			EC3DT442KU2 (Non-studded)	K	240	0.35	85.1	0.95	6080	71.5	1.12	0.94
				K	277	0.31	85.4	0.95	6080	71.2	1.11	0.93

NOTE: The "S" at the end of the ballast model number indicates a studded option. Remove the "S" for a non-studded ballast.

LUTRON® SPECIFICATION SUBMITTAL Page 3

Job Name:	Model Numbers:	
Job Number:		

PL-T 42W/835/4P 1CT

Product family description

PL-T Triple 4pin Fluorescent Lamp with Amalgam.

Features/Benefits

- ALTO® Lamp Technology - Passes EPA's TCLP test for non-hazardous waste.
- Utilizes amalgam technology to provide > 90% of rated lumens in ambient temperatures from 23F to 130F.
- Triple tube design available in 18, 26, 32, and 42W.
- Excellent Color Rendering - 82 Color Rendering Index (CRI).
- Broad Range of Color Temperature - Available in 2700, 3000, 3500 and 4100K.
- Dimmable - PL-T 4-pin lamps may be used with electronic dimming ballasts.
- Long Life - 12,000 hours.
- Energy Saving - Designed for use with electronic ballasts for lower operating costs and flicker-free starting.

Applications

- Ideal for downlights and medium bay multi-lamp fixtures for general lighting.

Notes

- Rated average life under specified test conditions with lamps turned off and restarted no more frequently than once every 3 operating hours. Lamp life is appreciably longer if lamps are started less frequently. (202)
- Approximate Initial Lumens. The lamp lumen output is based upon lamp performance after 100 hours of operating life, when the output is measured during operation on a reference ballast under standard laboratory conditions. (203)
- Design Lumens are the approximate lamp lumen output at 40% of the lamp's Rated Average Life. This output is based upon measurements obtained during lamp operation on a reference ballast under standard laboratory conditions. (208)

Footnotes

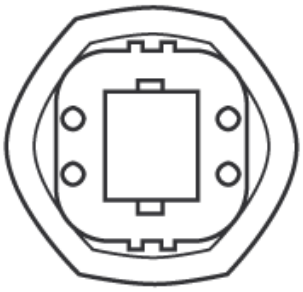
PHILIPS

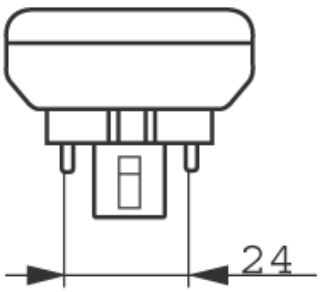
1

- HTA (High Temperature Application) HTA lamps are designed to achieve optimum light output in higher temperature applications (approx. 140-150 degrees Fahrenheit)
- HTA lamps are not recommended for dimming.

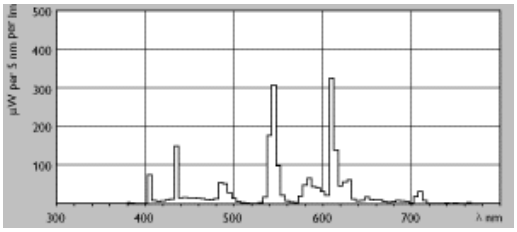
Product data	
Product Number	268755
Full product name	PL-T 42W/835/4P 1CT
Ordering Code	268755
Pack type	1 Lamp in a Folding Carton
Pieces per Sku	1
Skus/Case	12
Pack UPC	046677268756
EAN2US	
Case Bar Code	50046677268751
Successor Product number	
Base	GX24q-4
Base Information	4P
Execution	/4P [4 Pins]
Packing Type	1CT [1 Lamp in a Folding Carton]
Packing Configuration	12
Avg. Hrs. Life	16000 hr
Ordering Code	PL-T 42W/835/4P/ALTO
Pack UPC	046677268756
Case Bar Code	50046677268751
Watts	42W
Lamp Wattage EL	43.0 W
Lamp Voltage	- V
Dimmable	Yes
Color Code	835 [CCT of 3500K]
Color Rendering Index	82 Ra8
Color Designation	White
Color Description	835 White
Color Temperature	3500 K
Initial Lumens	- Lm
Initial Lumens	3200 Lm
Overall Length C	158.4 mm
Diameter D	39.85 mm
Diameter D1	39.65 mm
Product Number	268755

PL-T 42W



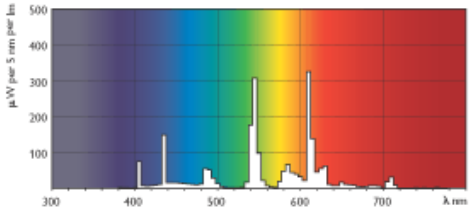


Base GX24q-4



Lightcolor /835

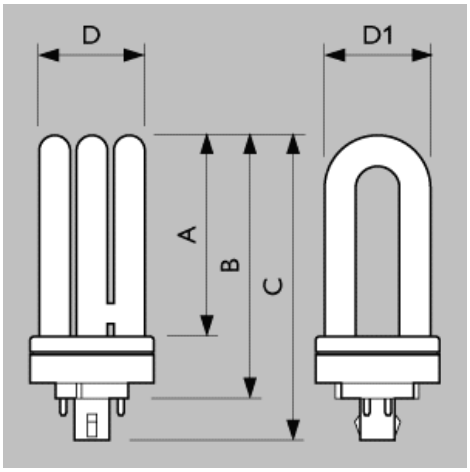
PL-T/835



Lightcolor /835

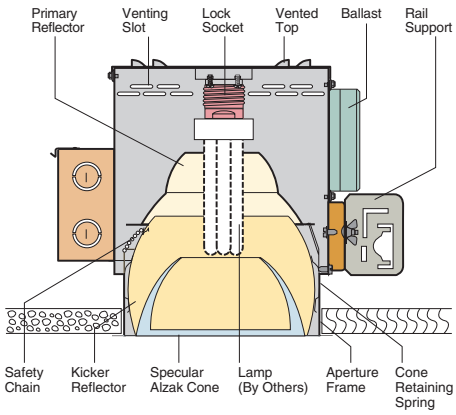
PL-T/835

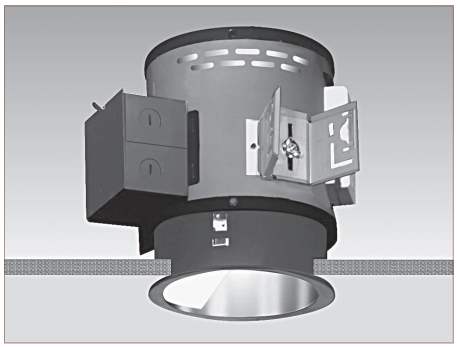
PHILIPS



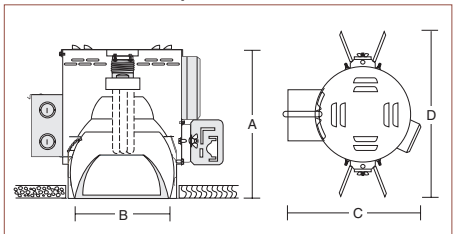
PL-T

	A	B	C	D	D1
Full product name	Max	Max	Max	Max	Max
PL-T 42W/ 835/4P 1CT	119	143.5	158.4	39.85	39.65





Dimensions and Lamps



Number	A Depth*	B Aperture	C Width	D Length	Lamp**
P905	9¾" 248mm	5⅞" 149mm	10½" 267mm	13¼" 337mm	26W or 32W Triple Tube
P915	10¼" 260mm	5⅞" 149mm	10½" 267mm	13¼" 337mm	42W Triple Tube

* Recess depth increases to 12½" with EM and DM accessories.
**For proper focal position for 26W lamps, add 26W to catalog number.

Matching Units

Medium beam downlight	Page P51
Medium wide beam downlight	Page P52
Wall washers	Pages P61, P62

P905 One 26W or 32W Triple Tube Lamp

P915 One 42W Triple Tube Lamp

Wall Washers
5⅞" Conoid Aperture

Optics and Applications
Full circle kicker reflectors direct a uniform wash light to adjacent walls. The pattern is free from spikes, striations or dropouts and features wide lateral distribution. The downlight component is uniform with a soft edge to blend with nearby units. Use in low to medium height ceilings.

Design Features
Steel housings protect the reflectors which are joined to each other for predictable performance. The turn and lock socket prevents the lamp from falling if it is not properly engaged. It is a dependable fail safe mechanism to prevent injury and litigation. Cone and window assembly may be rotated 360˚ after installation. Vented air flow design assures cool fixture temperature for optimal lamp performance. Maximum ceiling thickness 2". Ballast and lamp service from below.

Finish
Specular clear Alzak cones are standard. Optional colors and Softglow® finishes are available. Housings and structural parts are painted optical matte black to suppress stray light leaks. Steel parts are phosphate conditioned for corrosion resistance before painting.

Ballasts
Fully electronic, microprocessor controlled with variable starting current for inrush protection to assure rated lamp life. Input voltage ranges from 120V through 277V. Power factor .98, starting temperature 0° F (-18° C), THD < 10%. Pre-heat start < 1.0 second. End of lamp life protection. Rated for > 50,000 starts.

General
Fixtures are pre-wired, UL and C-UL listed for eight wire 75°C branch circuit wiring. Union made IBEW. Luminaire Efficiency Ratings (LER) do not apply to wall washers.

Accessories

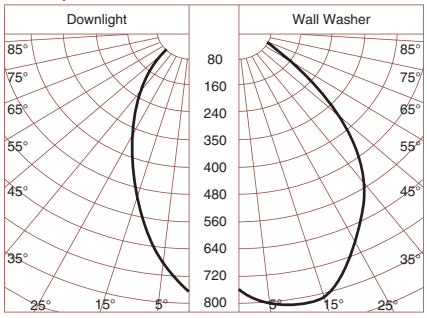
G	Gold cone.	R2	26" support rails.
H	Mocha cone.	R5	52" support rails.
P	Graphite cone.	WT	White trim flange.
T	Titanium cone.	WHT	White complete trim.
W	Wheat cone.	V347	347 volt ballast.
Y	Pewter cone.	F	Fuse.
Z	Bronze cone.		

S Softglow® finishes: add S before color letters. e.g. SW for Softglow® wheat cone, SC for Softglow® clear cone.
DM Dimming ballast. Specify watts and volts.
EM Emergency power includes integral charger light and test switch visible through aperture. Single lamp operation for 90 minutes. Specify volts.
WRL Wattage restriction label, specify wattage.
L Limited wall wash.
D Double wall wash.
C 250° corner wall wash.

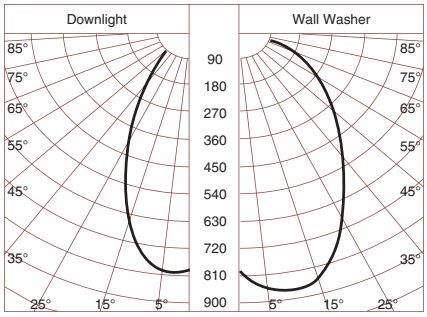
kurt versen
Kurt Versen Company Point Source Lighting
Westwood, New Jersey 07675

P63 P905 P915

Candlepower Distribution Curves



P905 One 32W Philips Triple Tube



P915 One 42W Philips Triple Tube

Multiple Units Footcandles

From Ceiling	2' from wall				3' from wall				4' from wall			
	2' Centers		3' Centers		3' Centers		4' Centers		4' Centers		6' Centers	
	CL	Mid	CL	Mid	CL	Mid	CL	Mid	CL	Mid	CL	Mid
1'	26	26	20	16	8	8	6	5	3	3	2	2
2'	48	43	38	27	15	14	12	10	7	7	5	4
3'	43	42	31	27	22	20	18	13	9	9	7	5
4'	32	32	23	21	21	20	17	15	12	11	10	6
5'	24	24	16	16	18	18	14	13	12	12	9	7
6'	18	18	12	12	15	15	11	11	11	11	8	7
7'	14	14	9	9	12	12	9	9	10	9	7	6
8'	11	11	7	7	10	10	7	7	8	8	6	5
10'	7	7	5	5	7	7	5	5	6	6	4	4
12'	5	5	3	3	5	5	4	4	4	4	3	3

P905 One 32W Philips Triple Tube
P905 One 32W Osram Sylvania x .85

From Ceiling	2' from wall				3' from wall				4' from wall			
	2' Centers		3' Centers		3' Centers		4' Centers		4' Centers		6' Centers	
	CL	Mid	CL	Mid	CL	Mid	CL	Mid	CL	Mid	CL	Mid
1'	51	46	40	28	15	14	12	9	6	5	5	3
2'	60	56	45	35	26	25	21	17	13	12	10	6
3'	47	47	33	30	27	25	22	17	15	14	11	9
4'	35	36	24	23	23	23	18	16	15	14	11	8
5'	27	27	18	18	19	19	15	14	14	13	10	8
6'	20	21	13	13	16	15	12	12	12	12	8	7
7'	16	16	10	10	13	13	10	10	10	10	7	7
8'	12	12	8	8	11	10	8	8	9	9	6	6
10'	8	8	5	5	7	7	6	6	6	6	4	4
12'	5	5	3	3	5	5	4	4	5	5	3	3

P915 One 42W Philips Triple Tube
P915 One 42W Osram Sylvania x .85

Notes

1 Data by IES methods. Compact fluorescent data vary due to lamp lumen differences, power input, burning position, ambient temperature and ballast characteristics. A modification factor should be applied.

2 Above data measure output of the wall washers only. No contribution from adjacent downlights or ceiling, floor or wall reflectances is included. Total illumination on the wall will increase with the contri-bution from other sources.

3 Data are cosine corrected to the plane of the wall. Uncorrected data would be substantially higher and depend upon the angle of incidence to the wall which varies with the mounting distance from the wall.

4 Kurt Versen wall washers are designed to minimize hard shadow lines at the ceiling. Light intensity increases gradually to the maximum area, just above eye level. The field is uniform, devoid of hot spots, striations and spikes.

5 If colored cones are required, only the downlight cone will be tinted. The kicker reflector is always clear Alzak for maximum output and true color rendition.

6 Specular cone multipliers: Use for downlight and brightness data only: Gold x .93, Wheat x .89, Pewter x .81, Mocha x .79, Graphite x .76, Titanium x .76, Bronze x .73.

7 Softglow® cone multipliers: Use for downlight and brightness data only: Clear x .98, Gold x .90, Wheat x .89, Pewter x .74, Mocha x .77, Graphite x .72, Titanium x .72, Bronze x .70.

8 Brightness data from the Average Luminance Method are inaccurate for small aperture downlights. They are theoretical calculations derived for large surfaces such as troffers. For a complete discussion refer to section Z brochure Z1.

Brightness

Number	Lamps	85°	75°	65°	55°	45°
P905	One 32W Philips Triple Tube	9	18	42	2748	11404
	One 32W Osram Triple Tube	11	27	55	6727	13651
P915	One 42W Philips Triple Tube	11	23	57	3685	15394
	One 42W Osram Triple Tube	12	24	60	7376	14970

Data in footlamberts. Photometer readings, Maximum Brightness Method. See note 8.

Kurt Versen Company, Westwood, New Jersey

EcoSystem Compact Fluorescent Ballast Models

Lamp Type	Lamp Watts	No. of Lamps	Model	Case Size	Input Voltage (VAC)	Input Current (A)	Input Power (W)	Ballast Factor (BF)	System Lumens (lm)	System Efficacy (lm/W)	Ballast Efficacy Factor	Relative Efficacy (RSE)
T4 4-Pin Quad-Tube or Triple-Tube 	18 W	1	EC3DT418KU1S (Studded)	K	120	0.180	21.3	0.95	1140	53.5	4.46	0.80
				K	220	0.098	21.1	0.95	1140	54.0	4.50	0.81
			EC3DT418KU1 (Non-studded)	K	240	0.092	21.4	0.95	1140	53.3	4.44	0.80
				K	277	0.080	20.8	0.95	1140	54.8	4.57	0.82
		2	EC3DT418KU2S (Studded)	K	120	0.34	41.1	0.95	2280	55.5	2.31	0.83
				K	220	0.18	39.6	0.95	2280	57.6	2.40	0.86
			EC3DT418KU2 (Non-studded)	K	240	0.17	39.4	0.95	2280	57.9	2.41	0.87
				K	277	0.15	39.9	0.95	2280	57.1	2.38	0.86
	26 W	1	EC3DT4MWKU1S (Studded)	K	120	0.22	26.4	0.95	1710	64.8	3.60	0.94
				K	220	0.12	26.8	0.95	1710	63.9	3.55	0.92
			EC3DT4MWKU1 (Non-studded)	K	240	0.11	26.9	0.95	1710	63.7	3.54	0.92
				K	277	0.10	27.0	0.95	1710	63.4	3.52	0.92
		2	EC3DT4MWKU2S (Studded)	K	120	0.43	51.6	0.95	3420	66.3	1.84	0.96
				K	220	0.23	49.9	0.95	3420	68.5	1.90	0.99
			EC3DT4MWKU2 (Non-studded)	K	240	0.21	50.6	0.95	3420	67.5	1.88	0.98
				K	277	0.19	51.4	0.95	3420	66.6	1.85	0.96
T4 4-Pin Triple-Tube 	32 W	1	EC3DT4MWKU1S (Studded)	K	120	0.27	32.4	0.95	2280	70.4	2.93	0.94
				K	220	0.14	31.6	0.95	2280	72.1	3.00	0.96
			EC3DT4MWKU1 (Non-studded)	K	240	0.13	31.7	0.95	2280	72.0	3.00	0.96
				K	277	0.11	31.7	0.95	2280	71.9	3.00	0.96
		2	EC3DT4MWKU2S (Studded)	K	120	0.55	66.0	0.95	4560	69.1	1.44	0.92
				K	220	0.29	64.5	0.95	4560	70.7	1.47	0.94
			EC3DT4MWKU2 (Non-studded)	K	240	0.26	63.0	0.95	4560	72.3	1.51	0.96
				K	277	0.24	65.5	0.95	4560	69.7	1.45	0.93
	42 W	1	EC3DT442KU1S (Studded)	K	120	0.36	43.2	0.95	3040	70.4	2.20	0.92
				K	220	0.20	42.9	0.95	3040	70.8	2.21	0.93
			EC3DT442KU1 (Non-studded)	K	240	0.18	42.7	0.95	3040	71.2	2.23	0.93
				K	277	0.15	42.6	0.95	3040	71.3	2.23	0.94
		2	EC3DT442KU2S (Studded)	K	120	0.73	87.6	0.95	6080	69.4	1.08	0.91
				K	220	0.39	85.9	0.95	6080	70.8	1.11	0.93
			EC3DT442KU2 (Non-studded)	K	240	0.35	85.1	0.95	6080	71.5	1.12	0.94
				K	277	0.31	85.4	0.95	6080	71.2	1.11	0.93

NOTE: The "S" at the end of the ballast model number indicates a studded option. Remove the "S" for a non-studded ballast.

LUTRON® SPECIFICATION SUBMITTAL Page 3

Job Name:	Model Numbers:	
Job Number:		

PL-T 42W/835/4P 1CT

Product family description

PL-T Triple 4pin Fluorescent Lamp with Amalgam.

Features/Benefits

- ALTO® Lamp Technology - Passes EPA's TCLP test for non-hazardous waste.
- Utilizes amalgam technology to provide > 90% of rated lumens in ambient temperatures from 23F to 130F.
- Triple tube design available in 18, 26, 32, and 42W.
- Excellent Color Rendering - 82 Color Rendering Index (CRI).
- Broad Range of Color Temperature - Available in 2700, 3000, 3500 and 4100K.
- Dimmable - PL-T 4-pin lamps may be used with electronic dimming ballasts.
- Long Life - 12,000 hours.
- Energy Saving - Designed for use with electronic ballasts for lower operating costs and flicker-free starting.

Applications

- Ideal for downlights and medium bay multi-lamp fixtures for general lighting.

Notes

- Rated average life under specified test conditions with lamps turned off and restarted no more frequently than once every 3 operating hours. Lamp life is appreciably longer if lamps are started less frequently. (202)
- Approximate Initial Lumens. The lamp lumen output is based upon lamp performance after 100 hours of operating life, when the output is measured during operation on a reference ballast under standard laboratory conditions. (203)
- Design Lumens are the approximate lamp lumen output at 40% of the lamp's Rated Average Life. This output is based upon measurements obtained during lamp operation on a reference ballast under standard laboratory conditions. (208)

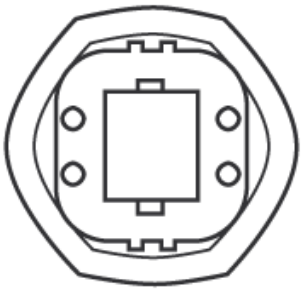
Footnotes

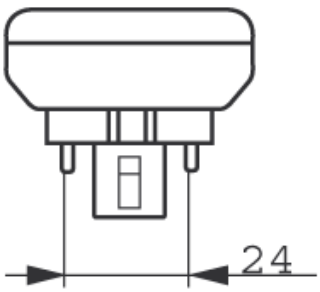
PHILIPS

- HTA (High Temperature Application) HTA lamps are designed to achieve optimum light output in higher temperature applications (approx. 140-150 degrees Fahrenheit)
- HTA lamps are not recommended for dimming.

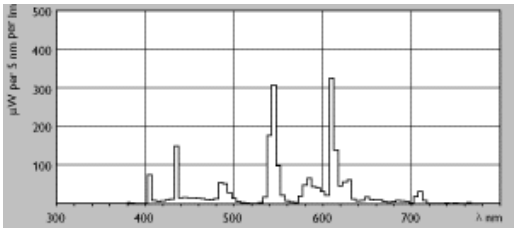
Product data	
Product Number	268755
Full product name	PL-T 42W/835/4P 1CT
Ordering Code	268755
Pack type	1 Lamp in a Folding Carton
Pieces per Sku	1
Skus/Case	12
Pack UPC	046677268756
EAN2US	
Case Bar Code	50046677268751
Successor Product number	
Base	GX24q-4
Base Information	4P
Execution	/4P [4 Pins]
Packing Type	1CT [1 Lamp in a Folding Carton]
Packing Configuration	12
Avg. Hrs. Life	16000 hr
Ordering Code	PL-T 42W/835/4P/ALTO
Pack UPC	046677268756
Case Bar Code	50046677268751
Watts	42W
Lamp Wattage EL	43.0 W
Lamp Voltage	- V
Dimmable	Yes
Color Code	835 [CCT of 3500K]
Color Rendering Index	82 Ra8
Color Designation	White
Color Description	835 White
Color Temperature	3500 K
Initial Lumens	- Lm
Initial Lumens	3200 Lm
Overall Length C	158.4 mm
Diameter D	39.85 mm
Diameter D1	39.65 mm
Product Number	268755

PL-T 42W



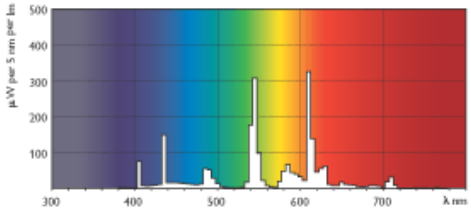


Base GX24q-4



Lightcolor /835

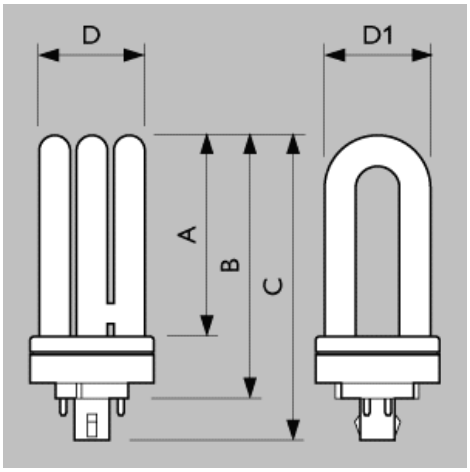
PL-T/835



Lightcolor /835

PL-T/835

PHILIPS

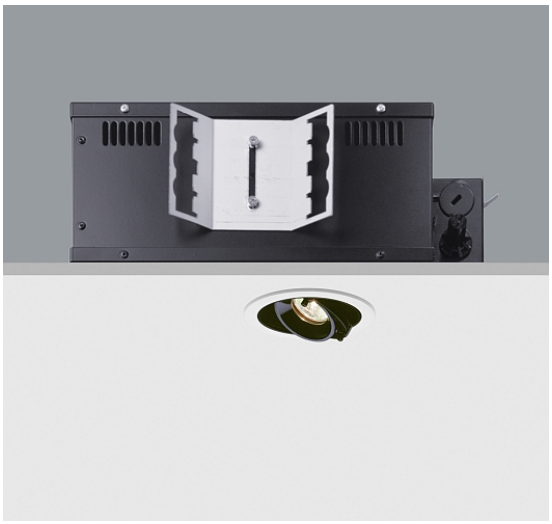


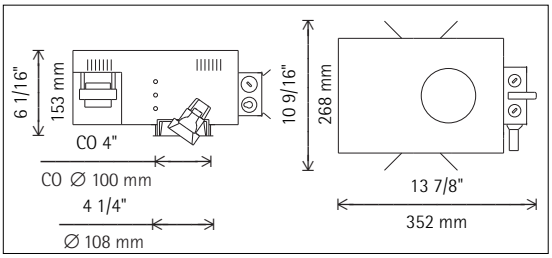
PL-T

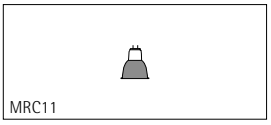
	A	B	C	D	D1
Full product name	Max	Max	Max	Max	Max
PL-T 42W/ 835/4P 1CT	119	143.5	158.4	39.85	39.65

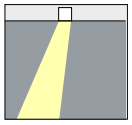
ERCO Gimbal Recessed spotlight

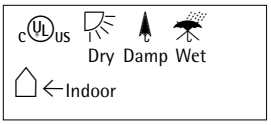
for low-voltage halogen lamps





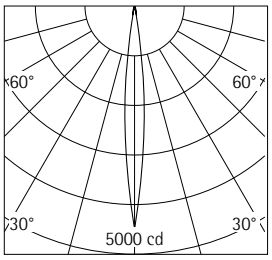






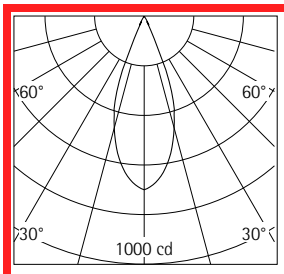
88100.023
MRC11 20W 12V GU4 10°
MRC11 20W 12V GU4 38°

Product description
Size 3
Luminaire: cast aluminum, black powder-coated.
Mounting ring: plastic, white (RAL9002), with multigroove baffle, cast aluminum, black powder-coated.
Fixing springs. Cardanic suspension of the luminaire in the mounting ring. 0°-40° tilt. Pivots are to be locked.
Mounting box for preinstallation with junction box for through-wiring. Magnetic transformer 120/12V, 60Hz inside mounting box. Snap-in plug for connection between transformer and luminaire.
Anti-glare ring as lamp retainer: plastic, black.
Type Non IC luminaire.
Insulation materials must be kept away from the luminaire by a minimum of 3". Thermally protected luminaire.
Suitable for damp location. Removal of luminaire allows access to transformer and junction box from below.
Max. ceiling thickness 3/4".
Weight 8.82lbs / 4.00kg



MRC11 20W 12V GU4 10°

h(ft)	E(fc)	D 10°
3	500	0'6"
6	125	1'1"
9	56	1'7"
12	31	2'1"
15	20	2'7"



MRC11 20W 12V GU4 38°

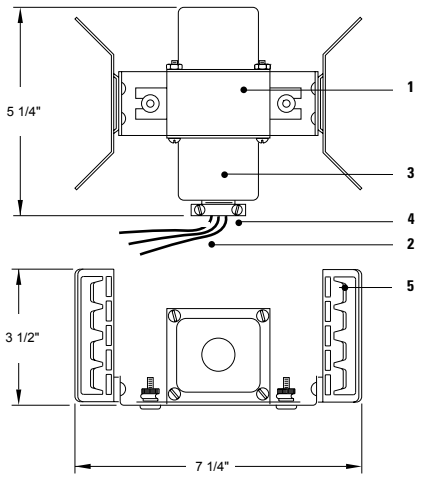
h(ft)	E(fc)	D 39°
3	78	2'1"
6	19	4'3"
9	9	6'4"
12	5	8'6"
15	3	10'7"

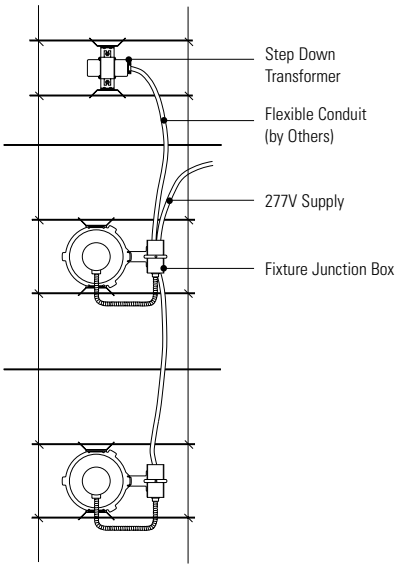
ERCO Lighting Inc.
160 Raritan Center Parkway
Suite 10
Edison, NJ 08837
USA
Tel.: +1 732 225 8856
Fax: +1 732 225 8857
info.us@erco.com

Technical Region: 120V/60Hz
We reserve the right to make technical and design changes.
Edition: 03.11.2009
Current version under www.erco.com/88100.023

Calculite® Accessories/Option **7997**

Incandescent Step Down Transformer





Features

1. **Transformer:** For supplying a 120V fixture from a 277V (60Hz) branch circuit - 20 amp minimum. Transformer is rated for 277V primary. 1.1 amp, 120V secondary, 300W maximum incandescent load. One transformer can be used to supply one or more fixtures, not to exceed the 300W total load.
2. **Wire Leads:** 4' long, 18 ga., SF1 wire leads provided. Flexible conduit shown in insert detail, by others.
3. **End Cover:** Aluminum, 16 ga.
4. **Connector:** 3/8" connector provided for attaching flexible conduit (by others).
5. **Mounting Brackets:** Adjustable 16 ga. steel, uses standard 3/4" or 1 1/2" lathing channels (by others) or Lightolier mounting bars.

Electrical

Transformer Characteristics

Lamp Wattage	Secondary Voltage	Total Input Wattage
75W	119V	78W
100W	118V	104W
150W	117V	157W
200W	116V	207W
300W	115V	300W

Options & Accessories

Mounting Bars: **1950**-18" Set of (2)
1951-18" Set of (2)

T-Bar Anchor Clips: **1956**-Set of (4), for use with above

Labels

U.L. (Suitable for Damp Locations), Union Made
Access above ceiling required.

Job Information **Type:**

Job Name:

Cat. No.:

Lamp(s):

Notes:

Lightolier a Genlyte Thomas Company www.lightolier.com
631 Airport Road, Fall River, MA 02720 • (508) 679-8131 • Fax (508) 674-4710

LIGHTOLIER®

The Power of Illumination

www.bplusl.com

Electronic transformer

B+L TECHNOLOGIES

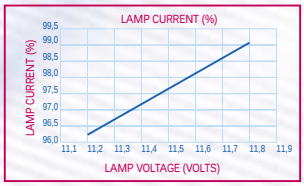
Project	**Princeton University - Sherrerd Hall**	Date	**7 April 2010**	Type	**FI**
Architect	**Frederick Fisher and Partners**	Phase	**Final Report**		3 of 8

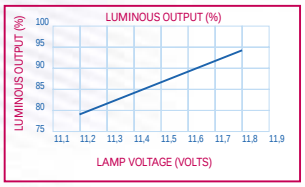
Jamie Devenger Senior Thesis Lighting/Electrical Option Advisors: Richard Mistrick and Ted Dannerth

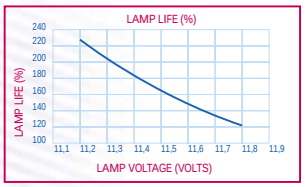
GENERAL SPECIFICATIONS :

- Input 120 Volts 50/60 Hz
- Power factor > .93
- THD < 20%
- Operating frequency > 10 kHz
- Class A insulation system, maximum transformer temperature for 90°C
- Minimum load of 10 Watts
- Generally the dimmer should have a minimum load of 40 W for proper functioning. Consult with UL recommendations for temperatures higher than 90°C
- For non short proof units, do not short output conductors
- Dimmable

GENERAL LAMP CHARACTERISTICS :







PLASTIC CASING

Electronic circuitry is encapsulated in a flame retardant plastic casing to withstand harsh and damp conditions for temperatures ranging from +5°F to +195°F (-15°C to 90°C)

Input : 120 VAC - for 12 Volts lamps

MODEL NO.	MAXIMUM LOAD	CLASS 2	OVERLOAD PROTECTION	SHORT CIRCUIT PROTECTION	RFI	CASING
CV90001	75 WATTS					D
CV90010	105 WATTS					B
CV90012	150 WATTS					B
CV90020	75 WATTS				YES	D
CV90021	200 WATTS					B
CV90027*,**	60 WATTS	YES	YES	YES	YES	C
CV90049	60 WATTS	YES	YES	YES	YES	A

SEE REQUIRED MOUNTING INSTRUCTIONS FOR CONVERTER MODEL CV90021 (ALSO RECOMMENDED FOR MODEL CV90012)

Input : 120 VAC - for 24 Volts lamps

MODEL NO.	MAXIMUM LOAD	CLASS 2	OVERLOAD PROTECTION	SHORT CIRCUIT PROTECTION	RFI	CASING
CV90038	75 WATTS					D
CV90052	150 WATTS					B

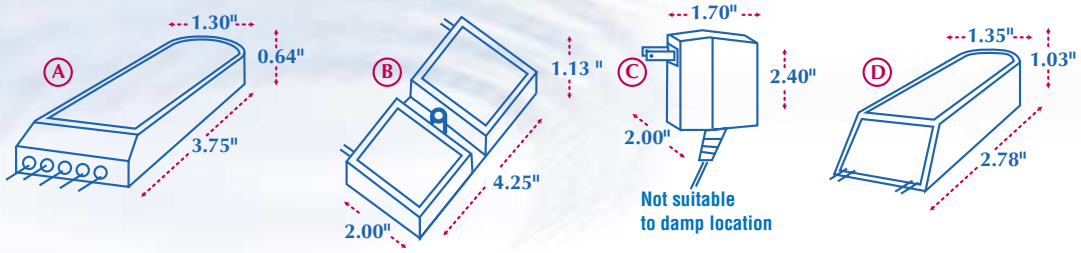
Input : 230 VAC - for 12 Volts lamps

MODEL NO.	MAXIMUM LOAD	CLASS 2	OVERLOAD PROTECTION	SHORT CIRCUIT PROTECTION	RFI	CASING
CV90036*	75 WATTS					D
CV90113*	150 WATTS					B

Input : 277 VAC - for 12 Volts lamps

MODEL NO.	MAXIMUM LOAD	CLASS 2	OVERLOAD PROTECTION	SHORT CIRCUIT PROTECTION	RFI	CASING
CV90111*	150 WATTS					B
CV90112*	75 WATTS					D

* Not dimmable ** Not suitable for damp location



OPEN FRAME

60 WATTS

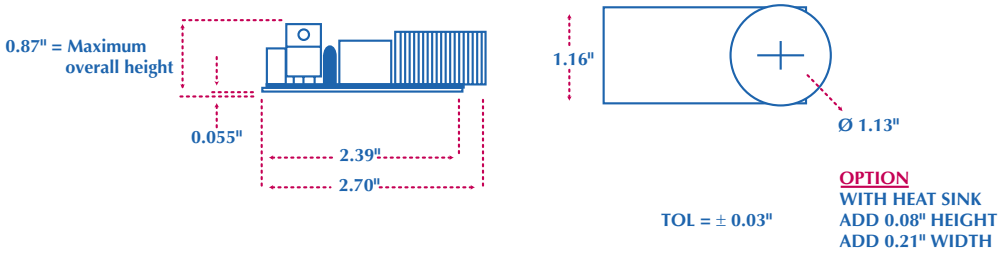
Input : 120 VAC - for 12 Volts lamps

MODEL NO.	CLASS 2	RFI	OVERLOAD PROTECTION	SHORT CIRCUIT PROTECTION	HEAT SINK
CV90090					
CV90091		YES			
CV90092	YES		YES	YES	
CV90093	YES	YES	YES	YES	
CV90094					YES

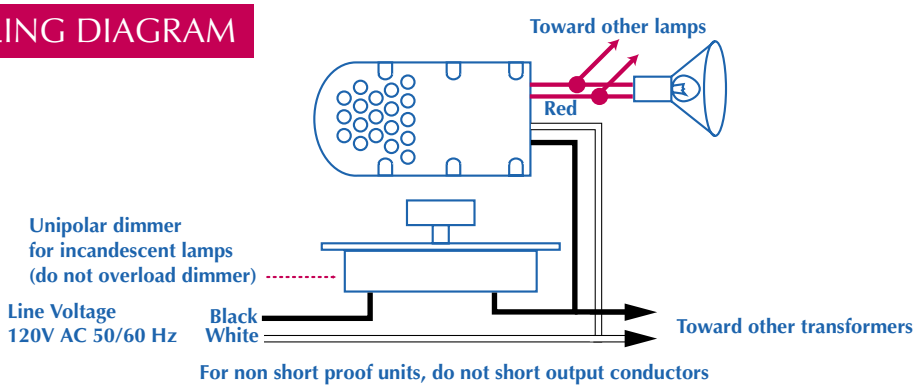
75 WATTS

Input : 120 VAC - for 12 Volts lamps

MODEL NO.	CLASS 2	RFI	OVERLOAD PROTECTION	SHORT CIRCUIT PROTECTION	HEAT SINK
CV90074					
CV90075		YES			
CV90076			YES	YES	
CV90077		YES	YES	YES	
CV90079					YES



CABLING DIAGRAM



WARRANTY

Limited warranty is offered and valid for original purchaser only
Subject to our standard terms and conditions. Consult factory.

1131 Autoroute Laval W.
Laval (Quebec)
Canada, H7L 3W3
Tel.: (450) 663-7884
1-800-361-1400
Fax: (450) 663-7638
www.bplusl.com
info@bplusl.com

Note that dimensions are approximate. B+L reserves the right to change dimensions, specifications and prices without notice.

PRINTED IN CANADA 2001/2K-02B

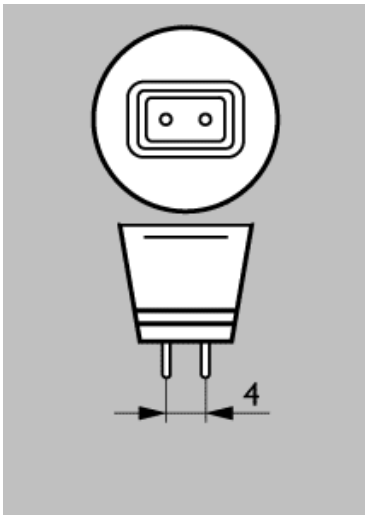
Pro FTD 20W 12V MR11 30D CL 1CT

Product family description

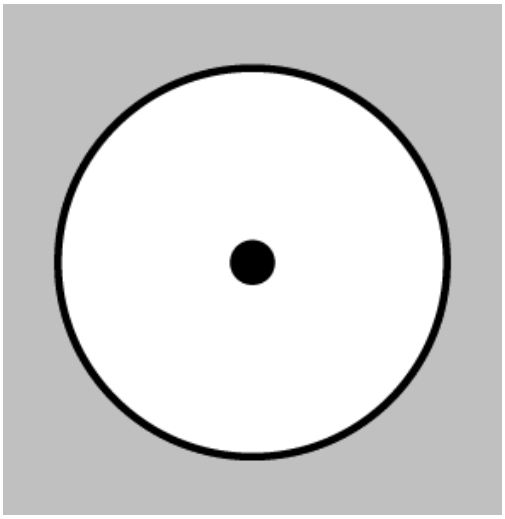
Product data	
Product Number	378224
Full product name	Pro FTD 20W 12V MR11 30D CL 1CT
Ordering Code	378224
Pack type	1 Lamp in a Folding Carton
Pieces per Sku	1
Skus/Case	50
Pack UPC	046677378226
EAN2US	
Case Bar Code	50046677378221
Successor Product number	
ANSI Code Halogen	FTD
Base	GU4
Bulb	MR11 [MR 11inch/35mm]
Bulb Finish	Clear
Operating Position	Universal [Any or Universal (U)]
Packing Type	1CT [1 Lamp in a Folding Carton]
Packing Configuration	10X5F
Ordering Code	20MRC11/FL30
Pack UPC	046677378226
Case Bar Code	50046677378221
Watts	20W
Voltage	12V
Dimmable	Yes
Beam Angle	30D
Color Rendering Index	100 Ra8
Color Temperature	3000 K
Overall Length C	40 mm
Diameter D	35.3 mm
Product Number	378224

PHILIPS

DICHRO GU4 30D

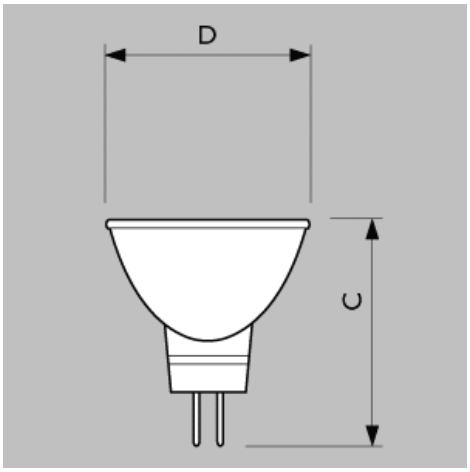


Base GU4



Operating Position Universal

PHILIPS



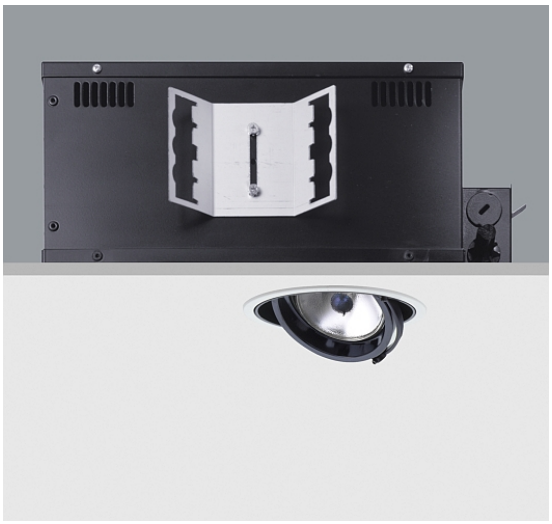
DICHRO GU4

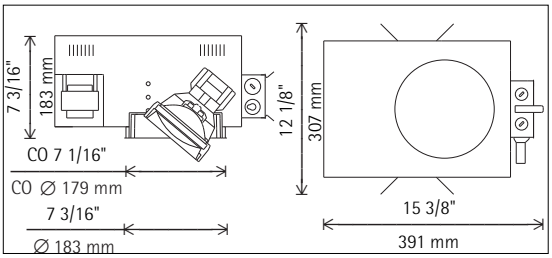
	C	D
Full product name	Max	Max
Pro FTD 20W 12V MR11 30D CL 1CT	40	35.3

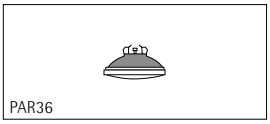
ERCO

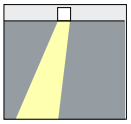
Gimbal Recessed spotlight

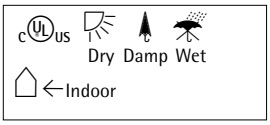
for low-voltage halogen lamps





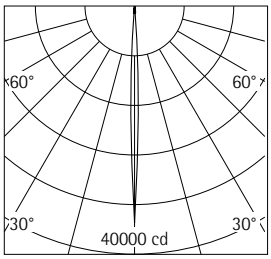






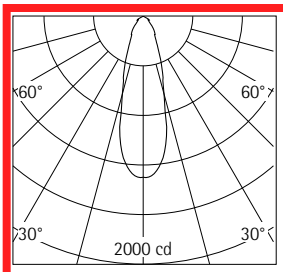
88135.023
~~PAR36 50W 12V Screw Term 5°~~
PAR36 50W 12V Screw Term 30°

Product description
Size 5
Luminaire: cast aluminum, black powder-coated.
Mounting ring: plastic, white (RAL9002), with multigroove baffle, cast aluminum, black powder-coated.
Fixing springs. Cardanic suspension of the luminaire in the mounting ring. 0°-40° tilt. Pivots are to be locked.
Mounting box for preinstallation with junction box for through-wiring. Magnetic transformer 120/12V, 60Hz inside mounting box. Snap-in plug for connection between transformer and luminaire.
Anti-glare ring as lamp retainer: plastic, black.
Type Non IC luminaire.
Insulation materials must be kept away from the luminaire by a minimum of 3". Thermally protected luminaire.
Suitable for damp location. Removal of luminaire allows access to transformer and junction box from below.
Max. ceiling thickness 3/4".
Weight 13.01lbs / 5.90kg



PAR36 50W 12V Screw Term 5°

h(ft)	E(fc)	D 4°
3	3889	0'3"
6	972	0'5"
9	432	0'8"
12	243	0'10"
15	156	1'1"



PAR36 50W 12V Screw Term 30°

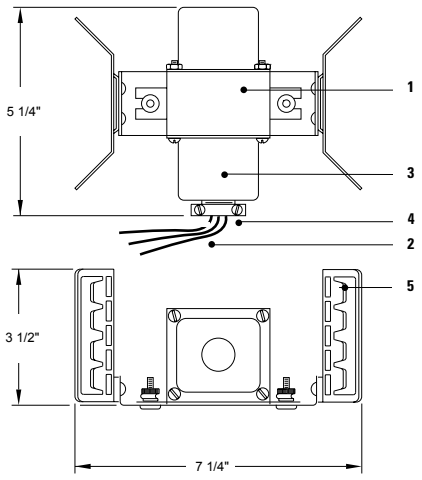
h(ft)	E(fc)	D 30°
3	144	1'7"
6	36	3'3"
9	16	4'10"
12	9	6'5"
15	6	8'0"

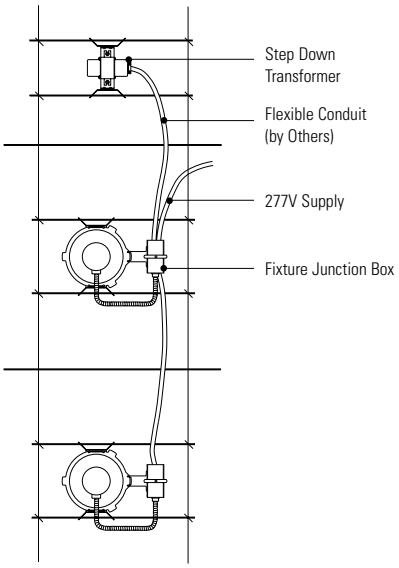
ERCO Lighting Inc.
160 Raritan Center Parkway
Suite 10
Edison, NJ 08837
USA
Tel.: +1 732 225 8856
Fax: +1 732 225 8857
info.us@erco.com

Technical Region: 120V/60Hz
We reserve the right to make technical and design changes.
Edition: 03.11.2009
Current version under
www.erco.com/88135.023

Calculite® Accessories/Option **7997**

Incandescent Step Down Transformer





Features

1. **Transformer:** For supplying a 120V fixture from a 277V (60Hz) branch circuit - 20 amp minimum. Transformer is rated for 277V primary. 1.1 amp, 120V secondary, 300W maximum incandescent load. One transformer can be used to supply one or more fixtures, not to exceed the 300W total load.
2. **Wire Leads:** 4' long, 18 ga., SF1 wire leads provided. Flexible conduit shown in insert detail, by others.
3. **End Cover:** Aluminum, 16 ga.
4. **Connector:** 3/8" connector provided for attaching flexible conduit (by others).
5. **Mounting Brackets:** Adjustable 16 ga. steel, uses standard 3/4" or 1 1/2" lathing channels (by others) or Lightolier mounting bars.

Electrical

Transformer Characteristics

Lamp Wattage	Secondary Voltage	Total Input Wattage
75W	119V	78W
100W	118V	104W
150W	117V	157W
200W	116V	207W
300W	115V	300W

Options & Accessories

Mounting Bars: **1950**-18" Set of (2)
1951-18" Set of (2)

T-Bar Anchor Clips: **1956**-Set of (4), for use with above

Labels

U.L. (Suitable for Damp Locations), Union Made
Access above ceiling required.

Job Information **Type:**

Job Name:

Cat. No.:

Lamp(s):

Notes:

Lightolier a Genlyte Thomas Company www.lightolier.com
631 Airport Road, Fall River, MA 02720 • (508) 679-8131 • Fax (508) 674-4710

LIGHTOLIER®

The Power of Illumination

www.bplusl.com

Electronic transformer

B+L TECHNOLOGIES

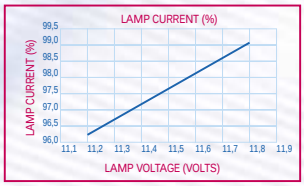
Project	**Princeton University - Sherrerd Hall**	Date	**7 April 2010**	Type	**FJ**
Architect	**Frederick Fisher and Partners**	Phase	**Final Report**		3 of 6

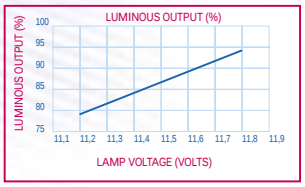
Jamie Devenger Senior Thesis Lighting/Electrical Option Advisors: Richard Mistrick and Ted Dannerth

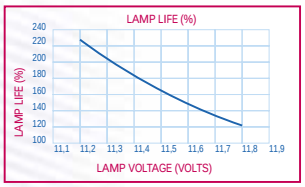
GENERAL SPECIFICATIONS :

- Input 120 Volts 50/60 Hz
- Power factor > .93
- THD < 20%
- Operating frequency > 10 kHz
- Class A insulation system, maximum transformer temperature for 90°C
- Minimum load of 10 Watts
- Generally the dimmer should have a minimum load of 40 W for proper functioning. Consult with UL recommendations for temperatures higher than 90°C
- For non short proof units, do not short output conductors
- Dimmable

GENERAL LAMP CHARACTERISTICS :







PLASTIC CASING

Electronic circuitry is encapsulated in a flame retardant plastic casing to withstand harsh and damp conditions for temperatures ranging from +5°F to +195°F (-15°C to 90°C)

Input : 120 VAC - for 12 Volts lamps

MODEL NO.	MAXIMUM LOAD	CLASS 2	OVERLOAD PROTECTION	SHORT CIRCUIT PROTECTION	RFI	CASING
CV90001	75 WATTS					D
CV90010	105 WATTS					B
CV90012	150 WATTS					B
CV90020	75 WATTS				YES	D
CV90021	200 WATTS					B
CV90027*,**	60 WATTS	YES	YES	YES	YES	C
CV90049	60 WATTS	YES	YES	YES	YES	A

SEE REQUIRED MOUNTING INSTRUCTIONS FOR CONVERTER MODEL CV90021 (ALSO RECOMMENDED FOR MODEL CV90012)

Input : 120 VAC - for 24 Volts lamps

MODEL NO.	MAXIMUM LOAD	CLASS 2	OVERLOAD PROTECTION	SHORT CIRCUIT PROTECTION	RFI	CASING
CV90038	75 WATTS					D
CV90052	150 WATTS					B

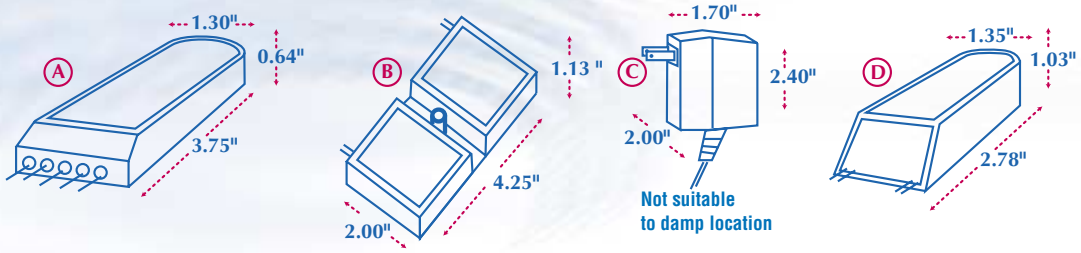
Input : 230 VAC - for 12 Volts lamps

MODEL NO.	MAXIMUM LOAD	CLASS 2	OVERLOAD PROTECTION	SHORT CIRCUIT PROTECTION	RFI	CASING
CV90036*	75 WATTS					D
CV90113*	150 WATTS					B

Input : 277 VAC - for 12 Volts lamps

MODEL NO.	MAXIMUM LOAD	CLASS 2	OVERLOAD PROTECTION	SHORT CIRCUIT PROTECTION	RFI	CASING
CV90111*	150 WATTS					B
CV90112*	75 WATTS					D

* Not dimmable ** Not suitable for damp location



OPEN FRAME

60 WATTS

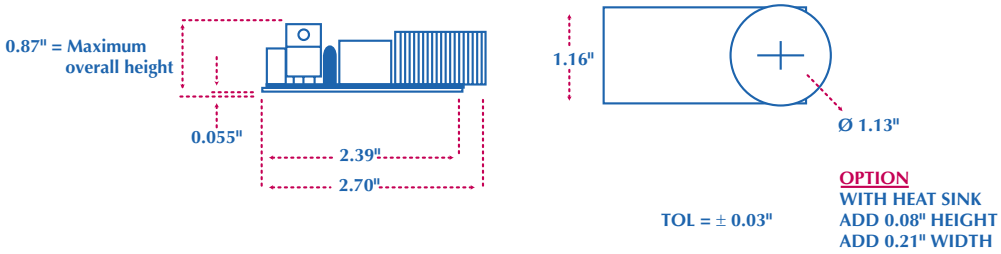
Input : 120 VAC - for 12 Volts lamps

MODEL NO.	CLASS 2	RFI	OVERLOAD PROTECTION	SHORT CIRCUIT PROTECTION	HEAT SINK
CV90090					
CV90091		YES			
CV90092	YES		YES	YES	
CV90093	YES	YES	YES	YES	
CV90094					YES

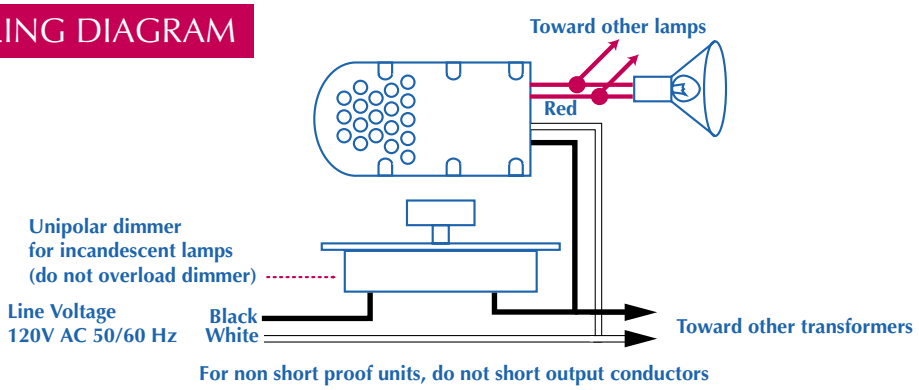
75 WATTS

Input : 120 VAC - for 12 Volts lamps

MODEL NO.	CLASS 2	RFI	OVERLOAD PROTECTION	SHORT CIRCUIT PROTECTION	HEAT SINK
CV90074					
CV90075		YES			
CV90076			YES	YES	
CV90077		YES	YES	YES	
CV90079					YES



CABLING DIAGRAM



WARRANTY

Limited warranty is offered and valid for original purchaser only
Subject to our standard terms and conditions. Consult factory.

1131 Autoroute Laval W.
Laval (Quebec)
Canada, H7L 3W3
Tel.: (450) 663-7884
1-800-361-1400
Fax: (450) 663-7638
www.bplusl.com
info@bplusl.com

Note that dimensions are approximate. B+L reserves the right to change dimensions, specifications and prices without notice.

PRINTED IN CANADA 2001/2K-02B

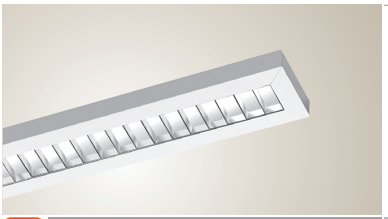
Incandescent 20–51 | Halogen 52–70 | Compact Fluorescent 71–86 | Fluorescent 87–120

HALOGEN LAMPS

Long Life IR, PAR36, PAR38 Lamps

Watts	Bulb	Base	Product Number	Symbols, Footnotes	Ordering Code	Volts	Pkg. Qty.‡	Description	Class, Filament	MOL (In.)	Rated Avg. Life (Hrs.)(93)	Approx. MBCP*	Lumens
HALOGEN LONG LIFE IR PAR30S SHORT LAMPS FEATURING HALOGEN INFRARED TECHNOLOGY AND WISO REFLECTOR (82, 86)													
These lamps are 130V lamps run on 120V.													
45	PAR30S	Med.	13850-3	$ Ⓔ	45PAR30S/IRC/HAL/SP10	120	15	Spot 10°	C, CC-8	3⅛	6000	10,000	650
			13851-1	$ Ⓔ	45PAR30S/IRC/HAL/FL25	120	15	Flood 25°	C, CC-8	3⅛	6000	2340	650
			13852-9	$ Ⓔ	45PAR30S/IRC/HAL/WFL40	120	15	Wide Flood 40°	C, CC-8	3⅛	6000	1050	650
HALOGEN PAR36 LAMPS													
11	PAR36	MP	15683-6		11PAR36Q/FL30	12	6	PAR, Flood	C, C-6	2¼	2000	—	60
36	PAR36	MP	15685-1		36OAR36Q/FL30	12	6	PAR, Flood	C, C-6	2¼	4000	—	450
50	PAR36	MP	15684-4		50PAR36Q/FL30	12	6	PAR, Flood	C, C-6	2¼	4000	—	650
			13082-3		50PAR36Q/VNSP6	12	12	PAR, Narrow Spot	C, C-6	2¼	4000	35,000	400

PEERLESS®



Planar

Indirect / Direct T5 / T5HO

Type:

Project:

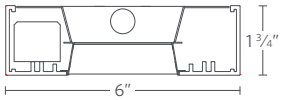
SPECIFICATIONS Pendant / 6" x 1 3/4" **PLA-PB**

CATALOG NUMBER

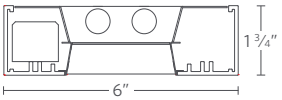
Examples: PLA IND 8FT 1 T5HO CG EB 120 PB WE

AVAILABLE FIXTURES

☐ **PLA - 1 Parabolic Louver**



☐ **PLA - 2 Parabolic Louver**



SPECIFICATIONS

Construction
Extruded and mitered aluminum housing and end cap.

Shielding
Parabolic semi-specular aluminum louvers or soft white acrylic diffuser. Opal acrylic diffuser overlay above louvers optional.

Reflectors
Die-formed diffuse aluminum.

Finish
Matte white standard, custom colors available.

Electrical
Specify 120 or 277 volts. Pre-wired with prescribed circuits as specified. C-UL listed and labeled. For special circuiting, consult factory.

Fixture Length
4' and 8' individual fixture sections. Request submittal drawings for longer length fixtures with joined 4' and 8' sections.

ORDERING LOGIC

Use guide below to order complete fixture runs from four feet to one-hundred feet in increments of four.

Fixture
PLA Planar

Designation
IND Individual
INT* Intermediate
EOR* End of row
**Consult factory for continuous runs*

Section Length
10FT Nominal 120"
8FT Nominal 96"
4FT Nominal 48"
2FT Nominal 24"
Consult factory for continuous rows.

# of lamps in cross section & lamp type
1 T5
1 T5HO
2 T5HO
Lamps provided by others.

Suspension
CG Cable and gripper 15"

Ballast Type
EDB Electronic dimming (Micro-case only, limited to 1.18" wide by 1.00" high)
Consult factory for specific ballast options.

Voltage
277 277V

Shielding
PB Parabolic diffuse aluminum baffle

Finish
WE Matte White
Custom colors available—consult factory.

Options
EMPK Emergency battery pack (limited to 1.18" wide X 1.00" high.)

PEERLESS LIGHTING • Box 2556, Berkeley, CA 94702-0556 • **Tel:** 510.845.2760 • **Fax:** 510.845.2776 • **www.peerless-lighting.com**

An AcuityBrands Company

EcoSystem Ballasts for linear T5 Lamps

Lamp	No. of	Model	Case Size	Input Voltage (VAC)	Input Current (A)	Input Power (W)	Ballast Factor (BF)	System Lumens (lm)	System Efficacy (lm/W)	Ballast Efficacy Factor	Relative Efficacy (RSE)
F35T5 (57.1 in.)	1	EC5 T535 J UNV 1	J	277 240 120	0.15 0.18 0.35	42.0 42.3 42.2	1.0 1.0 1.0	3650 3650 3650	87 87 87	2.38 2.38 2.38	0.83 0.83 0.83
F28T5 (45.2 in.)	2	EC5 T528 J UNV 2	J	277 240 120	0.23 0.27 0.54	64.5 65.0 65.2	1.0 1.0 1.0	5800 5800 5800	90 89 89	1.55 1.54 1.53	0.87 0.86 0.86
	1	EC5 T528 J UNV 1	J	277 240 120	0.12 0.14 0.27	32.6 32.9 32.9	1.0 1.0 1.0	2900 2900 2900	89 88 88	3.07 3.04 3.04	0.86 0.85 0.85
F21T5 (33.4 in.)	2	EC5 T521 J UNV 2	J	277 240 120	0.17 0.20 0.39	46.0 47.2 47.2	1.0 1.0 1.0	4200 4200 4200	91 89 89	2.17 2.12 2.12	0.91 0.89 0.89
	1	EC5 T521 J UNV 1	J	277 240 120	0.09 0.11 0.22	25.8 25.8 25.8	1.0 1.0 1.0	2100 2100 2100	81 81 81	3.88 3.88 3.88	0.81 0.81 0.81
F14T5 (21.6 in.)	2	EC5 T514 J UNV 2	J	277 240 120	0.12 0.14 0.28	32.8 33.3 33.3	1.0 1.0 1.0	2700 2700 2700	82 81 81	3.05 3.00 3.00	0.85 0.85 0.85
	1	EC5 T514 J UNV 1	J	277 240 120	0.07 0.08 0.16	19.0 19.2 19.2	1.0 1.0 1.0	1350 1350 1350	71 70 70	5.26 5.21 5.21	0.74 0.74 0.74

28W/835 Min Bipin T5 HE ALTO UNP

Product family description

High efficiency, environmentally responsible, ultra-slim lamps.

Features/Benefits

- Slim profile lamp and ballast.
- Better for the environment.
- Operates on programmed start ballasts.
- Fail-safe operation at end of life.
- Design flexibility.
- Improved optical control.
- Fixtures can be 40% smaller than T8 systems.
- Better fit in 2 x 2 and 2 x 4 grid ceilings.
- Low mercury (14W, 21W and 28W.)
- Energy efficient.
- Less material for less waste.

Applications

- Ideal for general, decorative and architectural lighting in offices, retail stores, hotels, schools and hospitals.

Notes

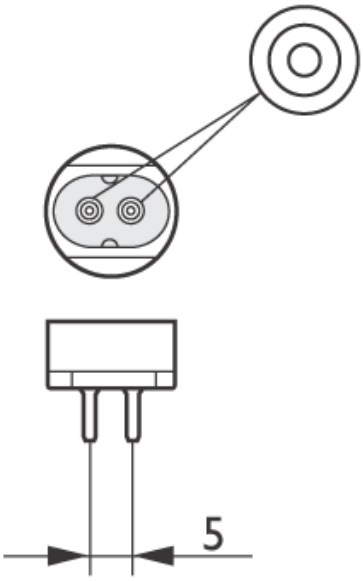
- Silhouette™ T5 nominal lamp lengths are shorter than standard sizes. See dimension chart for details.

Product data	
Product Number	230854
Full product name	28W/835 Min Bipin T5 HE ALTO UNP
Ordering Code	230854
Pack type	Unpacked
Pieces per Sku	1
Skus/Case	40
Pack UPC	046677230852
EAN2US	
Case Bar Code	50046677230857
Successor Product number	
System Description	High Efficiency
Base	Miniature Bipin
Base Information	Green [Green Base]
Bulb	T5 [16 mm]

PHILIPS

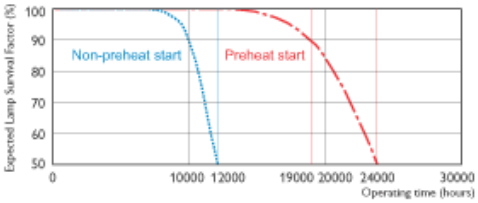
Product data	
Packing Type	UNP [Unpacked]
Packing Configuration	40
Rated Avg. Life	24000 hr
Type	na
Feature	na [Not Applicable]
Ordering Code	F28T5/835/ALTO
Pack UPC	046677230852
Case Bar Code	50046677230857
Watts	28W
Dimmable	Yes
Color Code	835 [CCT of 3500K]
Color Rendering Index	82 Ra8
Color Designation	White
Color Description	835 White
Color Temperature	3500 K
Initial Lumens	2900 Lm
Overall Length C	1163.2 mm
Diameter D	17 mm
Special packing	ALTO
Product Number	230854

TL5 HE



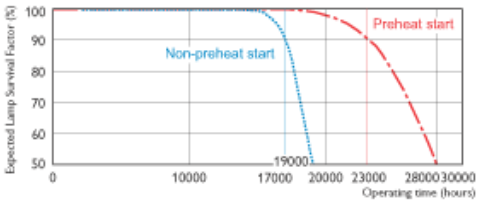
Base Miniature Bipin

PHILIPS



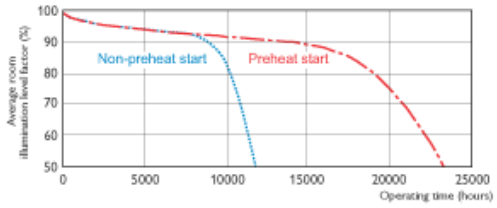
Life Expectancy 3h cycle

TL5 HE



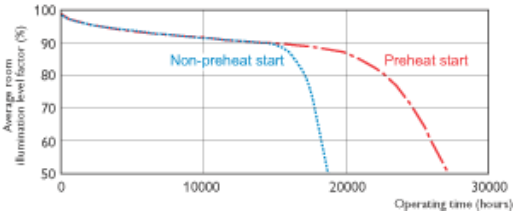
Life Expectancy 12h cycle

TL5 HE



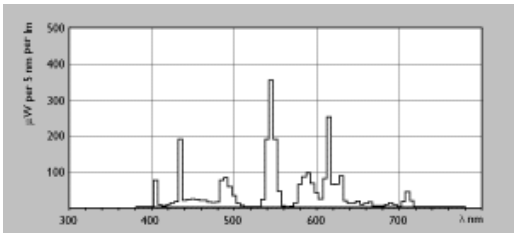
Service Life 3h cycle

TL5 HE



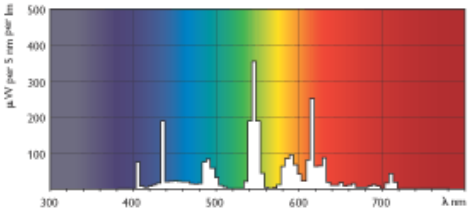
Service Life 12h cycle

TL5 HE



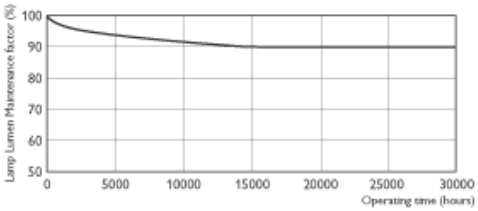
Lightcolor /835

TL5 HE/835

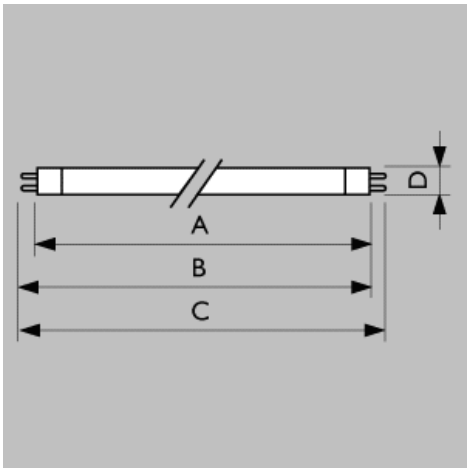


Lightcolor /835

TL5 HE/835



TL5 HE



TL5 HE

	A	B	B	C	D
Full product name	Max	Min	Max	Max	Max
28W/ 835 Min Bipin T5 HE ALTO UNP	1149.0	1153.7	1156.1	1163.2	17

www.sylvania.com

LINEARlight MULTI FLEX 24V
Flexible LED Strip

Key Features & Benefits

- Modules can be field cut every 6 LEDs to achieve a customized fit
- Extremely low heat generation eliminating the need for additional heat sinks
- Strips can be connected end to end for runs measuring up to 9 feet
- Long life: up to 50,000 hours
- Able to mount in straight and flexible channels
- UL2108 Wet Listed enabling installation in wet areas
- IP67 Rated
- Dimmable by pulse width modulation, a method that maintains consistent lumen output and color

The SYLVANIA LINEARlight MULTI FLEX 24V LED module provides new dimensions for innovative lighting.

LINEARlight MULTI FLEX modules offer exciting new possibilities for general illumination applications. They provide an alternative choice for linear applications such as cove lighting, refrigeration cases and pathway marking.

LINEARlight MULTI FLEX modules are ideal for edge lighting transparent and diffuse materials. They provide an optimal solution for precise backlighting of complex contours. They can also be used for lifesaving/rescue sign lights and commercial signs and for marking contours like escape routes, borders and stairs.

OPTOTRONIC® power supplies from SYLVANIA are specially designed to operate the LINEARlight MULTI FLEX modules. A wide range of 24V power supplies are available.

Product Offering

Ordering Abbreviation	Wattage	Color
LLMULTIFLX/THN/W3-827-3.2FT	6	2700K
LLMULTIFLX/THN/W3-865-3.2FT	6	6500K

Application Information

Applications

- Backlighting complex contours
- Border markings
- Cove lighting
- Display shelves
- Edge lighting transparent/ diffuse materials
- Path & contour marking

Note: For low level landscape applications please reference the LINEARlight MULTI FLEX 12V PIB (LED102)

Specifications and Certifications

c UL us LISTED

The SYLVANIA LINEARlight MULTI FLEX is UL2108 Wet Listed for US and Canada Class 2 Unit (UL file # E247649).

RoHS compliant

Listed in Sign Components Manual (SAM)

SEE THE WORLD IN A NEW LIGHT SYLVANIA

LED062R3 10/09

Specification Data

Catalog # Type

Project

Comments

Prepared by Date

Ordering Information

Item Number	Ordering Abbreviation	No. of LEDs	Power (W)	Voltage (Vdc)	Color Temperature	Initial Lumens	Lumens/ft	Watts/ft
70205	LLMULTIFLX/THN/W3-827-3.2 FT	96	6	24	2700K*	180	60	2
70182	LLMULTIFLX/THN/W3-865-3.2 FT	96	6	24	6500K*	245	82	2

* Color temperatures may vary within this range:
2700K = 2500 – 3200K
6500K = 5600 – 9000K

All data is related to the entire module and shall be considered as typical. Due to the special conditions of the manufacturing process of LEDs, the typical data of technical parameters can only reflect statistical figures. This data does not necessarily correspond to the actual parameters of each single product, which could differ from the typical data.

Ordering Guide

LLMULTIFLEX	/	THN	/	W3	8	27
LINEARlight MULTI FLEX		Thin		White 3rd Generation	CRI 8>80	Color

Power Supply Information

Max. Number of Modules per Power Supply

	OT17 (51622)	OT20 (51512)	OT50 (51598)	OT75 (51514)	OT96D (51510)	OT96 (51511)	OT240 (51515)
All Item Numbers	2	3	8	12	16	16	13/channel

1. A maximum of 3 modules can be connected in a single run. Please reference the "Wiring Diagram" in this document for specifics.
2. OPTOTRONIC® power supplies are optimally paired with SYLVANIA LED Modules and are specifically designed with protection features for safe operation.
3. The module is designed to work with Constant Voltage power supplies only. Reference the Power Supply PIB # ECS050 for product specific information.
4. These values are an approximation based on the typical "Power" values listed under the "Ordering Information" parameters. To accurately determine the maximum LED load, evaluate the application based on the application note "Determining the Maximum LED Load on a Constant Voltage Power Supply" LED026. This document can be found at www.sylvania.com.
5. LINEARlight MULTI FLEX 24V modules can be dimmed when used with the OT DIM or OTRGBDIM controllers. Because of the power consumed by these controllers, an additional de-rating of the overall "maximum" load must be factored into the above chart. To determine this de-rating (wattage) value please reference Step 8 of this same App. Note # LED026.

Minimum and Maximum Ratings

Parameter	Values
Ambient Operating Temperature	-10 to +40°C (-14 to +104°F)
Storage Temperature Range	0 to +40°C (-17.7 to +104°F)
Voltage Range	24±1
Reverse Voltage	24Vdc

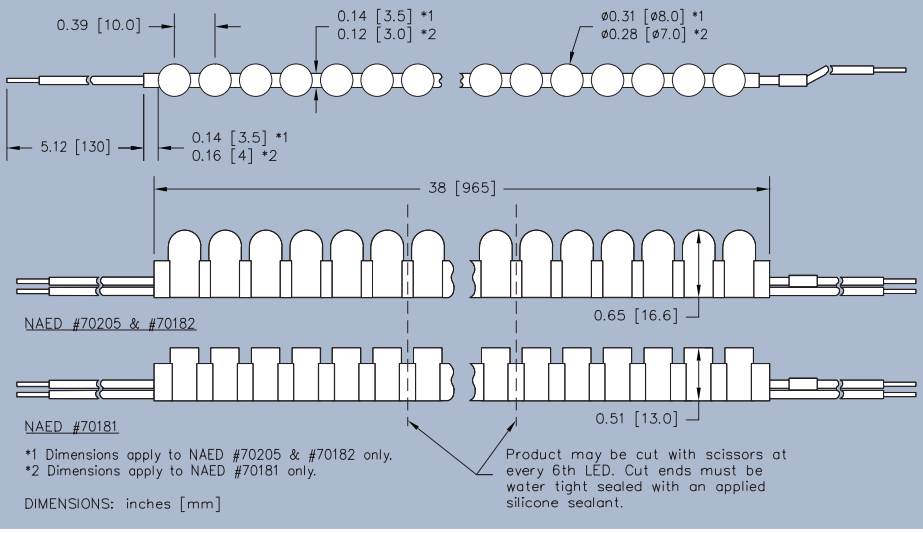
1. Temperature should be measured at any point on the module.
2. The maximum operating range at any point (up to 75°C) is to specify the absolute maximum Tc temperature without causing permanent damage to the LEDs.
3. Maximum rated life can be achieved if maximum temperature does not exceed 40°C.

Accessories

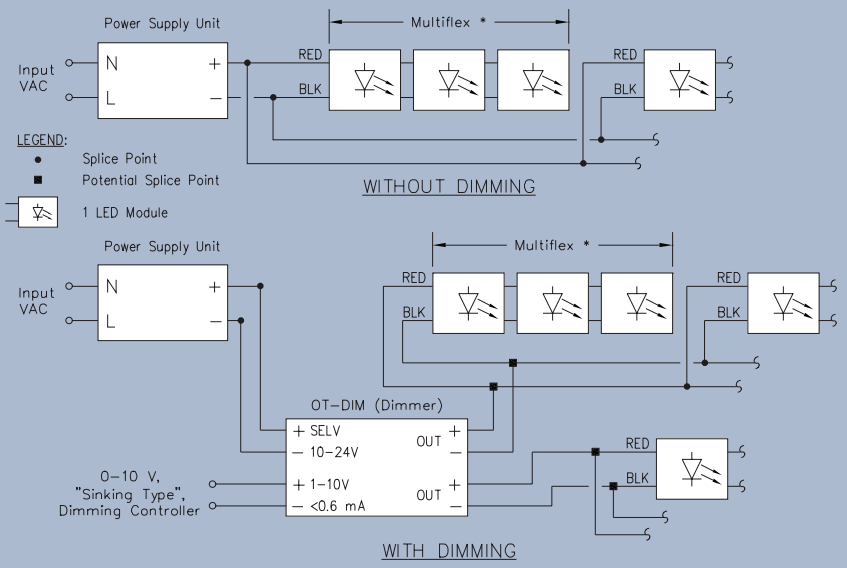
Item Number	Ordering Abbreviation	Description	Dimensions (L x W x H)	Package Qty.
70187*	LLMULTIFLX/STR-CHANNEL-3.2FT	Flexible Aluminum Channel	39.37" x 0.35" x 0.35"	20
70188*	LLMULTIFLX/THN/STR-CHANNEL-3.2FT	Straight Aluminum Channel	39.37" x 0.79" x 0.65"	5
70465**	LLMULTIFLX/RESIN/FLX-CHAN-3.2FT	Flexible Resin Channel	39.37" x 0.35" x 0.35"	10
70273**	LLMULTIFLX/RESIN/STR-CHAN-3.2FT	Straight Resin Channel	39.37" x 0.79" x 0.65"	10
70220	LLMULTIFLX/INSTALL-SCREWS	Product to Channel Securing Clips	n/a	20
70207	LLMULTIFLX/INSTALL-TOOL	Clip Installation Tool	n/a	1

* Indoor or outdoor rated
** As is, indoor only (outdoor if properly enclosed and isolated from elements).
Note: Item numbers 70465 and 70273 do not fulfill this product's UL requirements.

Assembly Diagram



Wiring Diagram



A maximum of 3 LED modules can be operated on a single feed.

Remaining load may be connected with parallel power feed(s). It is recommended, if at all possible, that the power supply be located near the middle of the run and these parallel feeds fed from here. This method helps reduce voltage drop potential resultant from long power feeds.

Reference the "Power Supply Information" maximum number of modules chart for maximum LED load per power supply requirements.

Safety Information

WARNING: ONLY QUALIFIED PERSONNEL SHOULD PERFORM INSTALLATION.

TO AVOID ELECTRICAL SHOCK OR COMPONENT DAMAGE, DISCONNECT POWER BEFORE ATTEMPTING INSTALLATION OF THE POWER SUPPLIES AND/OR MODULES.

Failure to install the power supplies and/or LED modules in accordance with the National Electric Code (NEC), all applicable Federal, State and local electric codes as well as the specific Underwriters Laboratories (UL) safety standards for the installation, location and application may cause serious personal injury, death, property damage and/or product malfunction.

1. The LED module itself and all its components shall not be subjected to mechanical stress and assembly must not damage or destroy conducting paths on the circuit board.
2. Installation of LED modules shall be made with regard to all applicable electrical and safety standards. Only qualified personnel should be allowed to perform installations.
3. Observe correct electrical polarity, incorrect polarity may destroy the module. (Depending on the product, incorrect polarity may lead to emission of red or no light.)
4. Electrostatic Discharge (ESD) precautions shall be incorporated when handling or installing the module.
5. Damage by corrosion and improper heat sinking will not be honored as a material defect claim. It is the user's responsibility to ensure adequate heat sink and protection against corrosive agents such as moisture, condensation or other harmful elements.
6. Modules may be hot to the touch. Use caution when handling.

Assembly Information

For complete installation requirements, refer to the LINEARlight MULTI FLEX User Guide

Precautions

1. The LED module will not stretch like ordinary rubber. Stretching will cause damage to the internal circuits.
2. Do not pull on the lead wires as there is risk of damage to the circuit.
3. Bending of the module can be accomplished only at the spaces between the LED. Avoid strained angles. Do not bend the LED module in the vertical axis.
4. Apply even force over the entire LED module when inserting into an aluminum channel.

Power Supply Selection

1. Refer to the section Power Supply Information for identification of the power supply requirement for a specified LED load.
2. The LINEARlight MULTI FLEX requires a 24Vdc Power supply. Do not operate an LED load in excess of the capacity of the power supply.

Electrical Connection

1. The LED module is equipped with polarized wires (red – positive, black – negative). Connect the low voltage load side of the power supply to the LED module ensuring correct polarity of the electrical connection. Crimp style or wire nut may be used along with insulating tape or shrink tubing.
2. Up to 3 LED modules can be connected in series to a single power feed connection. For large installations, connect multiple (3 module sets) in parallel.

Cutting

1. Cut the LINEARlight MULTI FLEX 24V LED module as indicated in the Assembly Diagram. Please refer to the LINEARlight MULTI FLEX User Guide for the exact location.
2. Apply silicone sealant after cutting the module.
3. Each module can be cut into no more than two workable sections. You must maintain the end sections with the existing leads. Middle sections without leads cannot be used.

Definition of a UL 2108 listed Low Voltage Lighting System as it pertains to this module includes: 1. A UL Listed Class 2 power supply. 2. An appropriate number of SYLVANIA's LINEARlight MULTI FLEX 24V LED modules based on the recommended max number of modules listed. 3. Splice connectors/cable systems. 4. Mounting channel.

The power supply must be mounted, wired, and grounded in accordance with all applicable NEC and ANSI standards.

All modular connections on the secondary side of the power supply must be made using an appropriate UL rated splice connection means. This connection means must be rated for the environment it is installed into. If additional wires and/or splice connections are necessary, wires are to be UL Listed and splice connectors must be UL rated and chosen of appropriate size for number and size of wires to be connected. WARNING: the low voltage secondary circuit shall not be grounded.

This information shall not supersede the requirement to follow all other safety, assembly and any other instructions listed in this document.

United States
OSRAM SYLVANIA
100 Endicott Street
Danvers, MA 01923

Trade
Phone: 1-800-255-5042
Fax: 1-800-255-5043

National Accounts
Phone: 1-800-562-4671
Fax: 1-800-562-4674

OEM/Special Markets
Phone: 1-800-762-7191
Fax: 1-800-762-7192

Display/Optic
Phone: 1-888-677-2627
Fax: 1-800-762-7192

Canada
OSRAM SYLVANIA LTD.
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Mississauga, ON L5S 1S4

Trade
Phone: 1-800-263-2852
Fax: 1-800-667-6772

OEM/Special Markets/Display/Optic
Phone: 1-800-265-2852
Fax: 1-800-667-6772

www.sylvania.com

www.sylvania.com

OPTOTRONIC®
Electronic 24V DC
LED Power Supplies

Power Supply Guide

OT6/100-120/24CE
OT17/120-277/24E
OT120/120-240/24S
OT30/120/24CORD
OT50/120/24LP
OT75/120-277/24E
OT96/120-277/24D
OT96/120-277/24
OT240/120-240/24/CH3

LED power supplies compatible with:
24V LED Modules

Key System Features

- Class 2 output
- Long life
- Short circuit and overload protection
- Remote mounting possible
- OT6, OT17, & OT75 models are rated for outdoor, damp locations
- OT96 & OT240 models are IP66 rated for wet locations

Application Information

OSRAM OPTOTRONIC
power supplies are ideally suited for:

- Low & medium power applications
- Signs
- Compact installations
- Path and roadway marking
- Backlighting
- Step and seat marking
- Effect lighting
- Panel lighting
- Ambience lighting inside furniture
- Wall washing
- General lighting

OSRAM OPTOTRONIC power supplies are compact and electronically stabilized. The wide range of input voltage, on select models, from 100 to 277 VAC enables worldwide use on single-phase AC power lines. These supplies are available with 24VDC outputs.

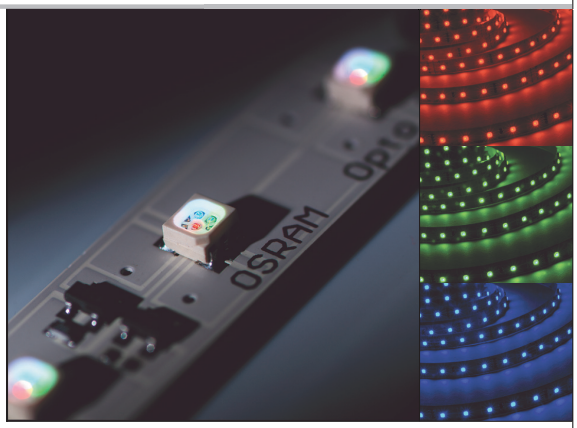
OPTOTRONIC power supplies are protected against open circuit, short circuit, overload and overheating conditions. They meet the highest industry standards.

System Information

OSRAM SYLVANIA has introduced a full line of LED modules (Light Emitting Diodes) and power supply products.

LED modules can be used in a wide variety of applications due to our variable module design, module geometries, and range of available colors.

The LEDs are available in many different configurations to meet the demands of these applications. For additional information about OSRAM LED systems, contact OSRAM SYLVANIA or visit www.sylvania.com/LED.



ECS050R10 – 9/2009

SEE THE WORLD IN A NEW LIGHT SYLVANIA

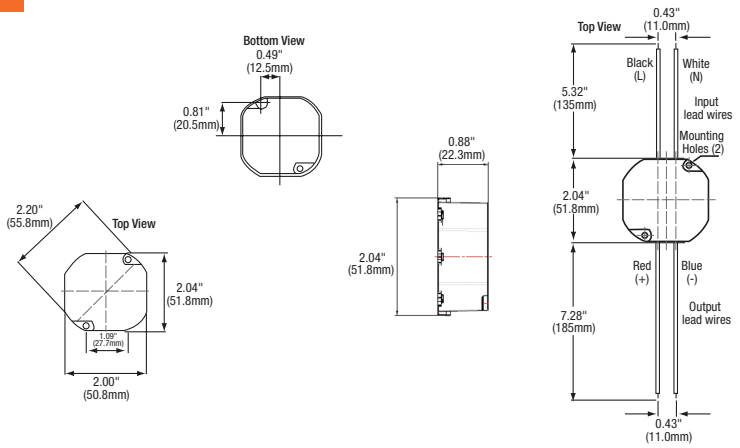
OPTOTRONIC® 24V DC SUPPLIES

Electronic LED Power Supplies

OT6 Case

Packaging:
Quantity: 20 pieces/carton
Weight: 0.16 lbs each (approx.)
3.72 lbs/carton

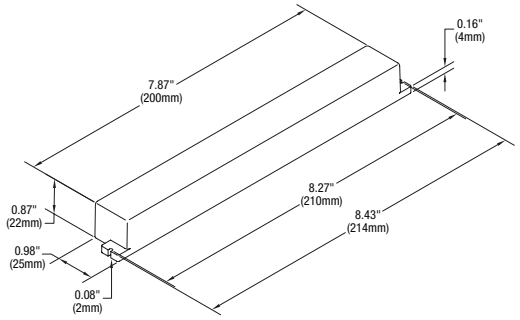
Wiring: Leads only
(no connectors)
Input: (18AWG wire)
Output: (18AWG wire)



OT17 Case

Packaging:
Quantity: 50 pieces/carton
Weight: 0.36 lbs each (approx.)
18.3 lbs/carton

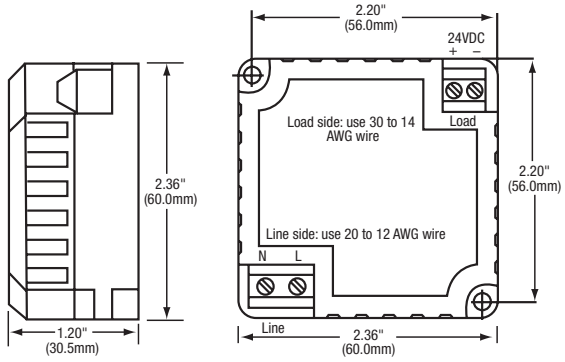
Wiring: Leads only (no connectors)
Input: 6" (18AWG wire) black & white wires
Output: 6" (18AWG wire)
gray+ & black– wires



OT20 Case

Packaging:
Quantity: 30 pieces/carton
Weight: 0.21 lbs each (approx.)
6.30 lbs/carton

Wiring: Connectors only
(No leads provided) Use solid
or stranded copper wire only



For complete power supply and LED module details, refer to the OSRAM SYLVANIA LED Systems Specification Guide or go to www.sylvania.com

SEE THE WORLD IN A NEW LIGHT SYLVANIA

OPTOTRONIC® 24V DC SUPPLIES (DC OUTPUT)

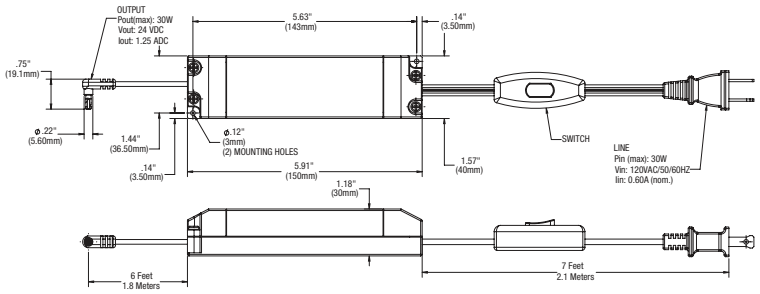
Electronic LED Power Supplies

Item Number	51503	OT	6/	100-120/	24	CE	Circular External *
OPTOTRONIC							Output Voltage (DC)
Output Wattage (6 watts)							Input Voltage (AC)

* Additional descriptors are as follows:
CE = Circular External, CH3 = 3 Channels, D = Indoor, E = External, LP = Low Profile, S = Square

OT30 Case

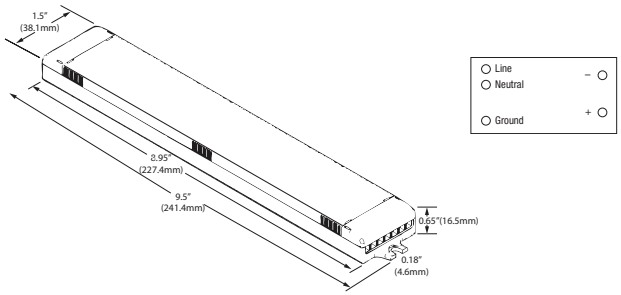
Packaging:
Quantity: 50 pieces/carton
Weight: 0.63 lbs each (approx.)
31.77 lbs/carton



OT50 Case

Packaging:
Quantity: 20 pieces/carton
Weight: 0.4 lbs each (approx.)
8.5 lbs/carton

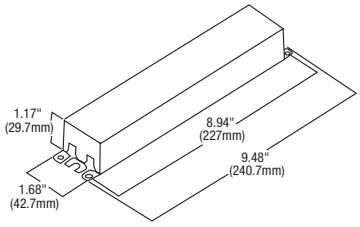
Wiring: Connectors only
(No leads provided)
Use 14-22AWG solid or
stranded copper wire only



OT75 Case

Packaging:
Quantity: 10 pieces/carton
Weight: 1.35 lbs each (approx.)
14 lbs/carton

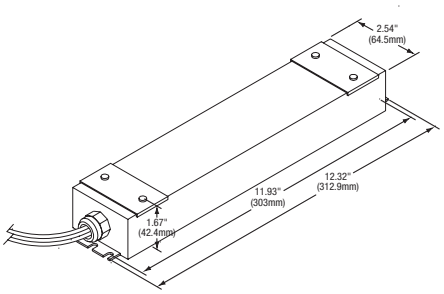
Wiring: Leads only (no connectors)
Input: 9" (18AWG wire) black & white wires
Output: 9" (18AWG wire)
red+ & blue– wires



OT96 Case (Wet Rated)

Packaging:
Quantity: 16 pieces/carton
Weight: 2 lbs each (approx.)
33 lbs/carton

Wiring: Leads only (2.76" 18AWG wire)
Input: Black (L), White (N), & Green/Yellow (GRD) wires with a UL Listed, 1/2" Metallic fitting
Output: Gray (+) & Black (–) with a UL Listed, 1/2" plastic fitting



Specifications subject to change without notice.

the system solution®

SPECIFICATION DATA

Catalog #	Date	Type
Project	Prepared by	
Comments		

OPTOTRONIC LED Power Supplies (DC Output)

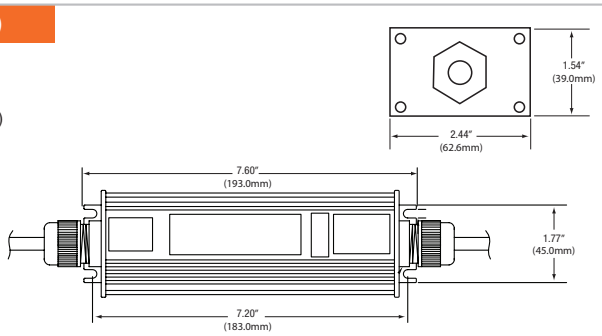
Item Number	Description	Nominal Input Voltage (VAC)	Nominal Input Current (Amps)	Power Factor	Nominal Input Power (W)	Output Voltage (VDC)	Output Power Range (W)	Max. Line Ripple (V)	UL/ETL file#	Location Rating
51503	OT6/100-120/24CE	120	0.11	0.55	7.1	24.0±0.5	0.9-6	±0.2V	E258264	Damp
51622	OT17/120-277/24E	120 277	0.19 0.10	0.92	21	24.0±0.5	0.8-17	±1.0V	E220096	Damp
51512	OT20/120-240/24S	120 240	0.38 0.19	0.5	23	24.0±1.0	0.9-20	±0.2V	E258264	Dry
51521	OT30/120/24CORD	120	0.63	0.5	38	24.0±1.0	1-30	±1.5V	3137489	Dry
51598	OT50/120/24LP	120	0.47	0.99	56	24.0±0.5	0.9-50	±0.2V	E248522	Dry
51514[3]	OT75/120-277/24E	120 277	0.76 0.33	0.99	90	24.0±0.5	0.9-75	±0.2V	E258264	Damp
51510	OT96/120-277/24D	120 277	0.91 0.39	0.99	108	24.0±0.5	0.8-96	±1.0V	E220096	Dry
51511	OT96/120-277/24	120 277	0.91 0.39	0.99	108	24.0±0.5	0.8-96	±1.0V	E220096	WET[2]
51515	OT240/120-240/24/CH3	120 240	2.39 1.19	0.99	285	24.0±0.5	0.8-240	±1.0V	E220096	WET[2]

1: All power supplies can be remote mounted up to 32 feet. Although it is possible to exceed the remote mounting distance, the installer and/or end user must take precautions to prevent and/or test the effects of EMI (electromagnetic interference).
2: Use wiring rated and marked PLTC, CL3R, and "sun resistant"
3: 51514 replaces 51513 (OT75/120/24), which is discontinued

OT96 Case (Dry Rated)

Packaging:
Quantity: 20 pieces/carton
Weight: 1.6 lbs each (approx.)
33 lbs/carton

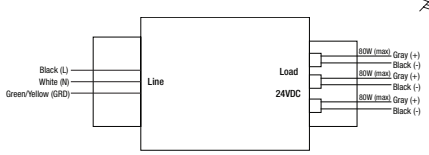
Wiring: Leads only
(12" 18AWG wire)
Input: Black (L), White (N),
& Green/Yellow (GRD)
Output: Red (+) & Black (–)

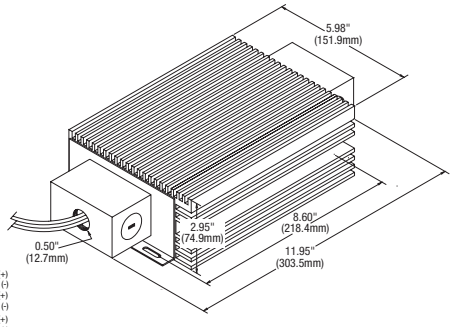


OT240 Case

Packaging:
Quantity: 5 pieces/carton
Weight: 11 lbs each (approx.)
53 lbs/carton

Wiring: Leads only
(6.9" 18AWG wire)





OPTOTRONIC®

24V DC LED Power Supplies

Specifications

Class 2 Outputs
Input Voltage Range (Min/Max):
OT6: 90 - 132 VAC
OT20 & OT240: 108 - 254 VAC
OT30 & OT50: 108 - 132 VAC
OT17, OT75 & OT96: 100 - 305 VAC
Input Frequency: 50/60Hz
Ambient Temp. Range:
-20°C through +50°C
OT30: -20°C through +45°C
OT75/120-277: -25°C through +60°C
OT17, OT96 & OT240: -30°C through +70°C
Max. Case Temp:
OT30: 45°C
OT6, OT50: 70°C
OT20: 75°C
OT17, OT75, OT96 & OT240: 90°C

OT6, OT17, OT20, OT75: UL 1310, UL48 Recognized for US & Canada Class 2 Unit
OT96 & OT240: UL48 Recognized for US & Canada Class 2 Unit
OT50: UL1310 Recognized for US & Canada Class 2 Unit

OT30: ETL listed and conforms to UL1310

OT6, OT75 are CSA approved
FCC 47CFR Part 15 compliant RoHS compliant

Life / Warranty

OPTOTRONIC LED Power Supply Products are covered by our OPTOTRONIC power supply warranty. For additional details, refer to our latest version of the warranty bulletin.

OSRAM SYLVANIA
National Customer
Service and Sales Center
1-800-LIGHTBULB
(1-800-544-4828)
www.sylvania.com

Specifications subject to change without notice.

www.sylvania.com

LINEARlight POWER FLEX

Flexible High Light Output LED Modules

Key Features & Benefits

- High lumen output for use in various conventional lighting applications
- Flexible circuit board with self-adhesive backing allows for easy installation in complex contours
- Modules can be conveniently field cut to achieve a customized fit every 6 LEDs
- Dimmable by pulse width modulation, a method that maintains consistent lumen output and color
- Electrical mounting tracks and optical diffusers available for easy installation
- Long life: up to 60,000 hours (L_{50}) when temperature at Tc point is maintained at 40°C minimizing maintenance frequency

LINEARlight POWER FLEX LED modules are suitable alternatives to conventional sources used in linear and curved architecture and display lighting applications. The module consists of high brightness, white LEDs uniformly spaced on a flexible, self-adhesive substrate.

LINEARlight POWER FLEX modules have a service life of 60,000 hours (L_{50}) with proper thermal management. The module is optimally paired with OPTOTRONIC® 24Vdc power supplies. Connector accessories are also available to simplify installation. To facilitate easy installation, optional connector assemblies and mounting tracks are available in 18" and 56" lengths. These may be paired with diffuser accessories to modify and soften light distribution.

Product Offering

Ordering Abbreviation	Wattage	Color
LNRPWRFLX/LM10P/W3F-827	72	2700K
LNRPWRFLX/LM10P/W3F-830	72	3000K
LNRPWRFLX/LM10P/W3F-835	72	3500K
LNRPWRFLX/LM10P/W3F-840	72	4000K
LNRPWRFLX/LM10P/W3F-854	48	5400K

Application Information

Applications

- Backlighting complex contours
- Border marking
- Cove lighting
- Display shelves
- Edge lighting
- Path and contour marking
- Recessed lighting

Specifications and Certifications

c UL us LISTED

The OSRAM LINEARlight POWER FLEX is UL2108 Listed for US and Canada Class 2 Unit. (UL file # E247649)

RoHS compliant

Listed in the Sign Components Manual (SAM)

SEE THE WORLD IN A NEW LIGHT SYLVANIA

LED045R9 11/09

Specification Data

Catalog #	Type
Project	
Comments	
Prepared by	Date

Ordering Information

Item Number	Ordering Abbreviation	Module Length (ft)	No. of LEDs	Power (W)	Voltage (Vdc)	Module Current (A)	Color Temperature	Lumens (lm)*	Lumens/ft	Watts/ft
70268	LNRPWRFLX/LM10P/W3F-827	9	120	72	24	3	2700K	1900	211	8
70331	LNRPWRFLX/LM10P/W3F-830	9	120	72	24	3	3000K	1900	211	8
70325	LNRPWRFLX/LM10P/W3F-835	9	120	72	24	3	3500K	2450	272	8
70328	LNRPWRFLX/LM10P/W3F-840	9	120	72	24	3	4000K	2450	272	8
70098	LNRPWRFLX/LM10P/W3F-854	9	120	48	24	2	5400K	2800	311	5.3

* All data is related to entire module measured at Tc point of 25°C. Data reflects statistical mean values. Actual data may differ depending on variances in the manufacturing process. End users need to take into account the lumen depreciation as the temperature rises with various thermal management solutions installed.

Ordering Guide

LNRPWRFLX	/	LM10P	/	W3F	8	27	
LINEARlight POWER FLEX		Identification Code		White 3rd Generation Fine Bin	CRI 8>80	Color Temperature 27 = 2700K 30 = 3000K 35 = 3500K	40 = 4000K 54 = 5400K

Power Supply Information

Max. No. of Modules & Max. Length per Power Supply

	OT17 (51622)	OT20 (51512)	OT50 (51598)	OT75 (51514)	OT96 (51510, 51511)	OT240 (51515)
All 72 W products	4 22"	5 2.3'	0.65 (13) 6.1'	1.0 (20) 9.2'	1.3 (26) 11.9'	1.1 (22) 10.1'
All 48 W products	7 3.2'	8 3.7'	1 (20) 9.2'	1.6 (31) 14.2'	2 (40) 18.3'	1.7 (33) 15.1'

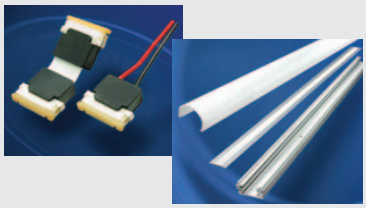
Notes:
1. A coupon (Smallest Electrical Unit - SEU) is a sub-section of the module containing 6 LEDs and at a length of 5.5". Please reference this bulletin's "Assembly Diagram" for details.
2. OPTOTRONIC® power supplies are optimally paired with SYLVANIA LED modules and are specifically designed with protection features for safe operation.
3. The module is designed to work with Constant Voltage power supplies only. Reference the Power Supply PIB # ECS050 for product specific information.
4. These values are an approximation based on the typical "Power" values listed under the "Ordering Information" parameters. To accurately determine the maximum LED load, evaluate the application based on the application note "Determining the Maximum LED Load on a Constant Voltage Power Supply" LED026. This document can be found at www.sylvania.com.
5. LINEARlight POWER FLEX modules can be dimmed when used with the OT DIM, or OTRGBDIM controllers. Because of the power consumed by these controllers, an additional de-rating of the overall "maximum" load must be factored into the above chart. To determine this de-rating (wattage) value please reference Step 8 of this same App. Note #LED026.
6. The OT240 has 3 channels at 80 W each. Values represented in Chart are "per channel".
7. Parallel runs may be required to achieve the numbers listed above. Please reference this bulletin's "Wiring Diagram" for product specific wiring instructions.

Minimum and Maximum Ratings

Parameter	Values
Operating Temperature at Tc point	-20... +85°C (-4 to +185°F)
Storage Temperature	-20... +85°C (-22 to +185°F)
Voltage Range	23...25 Vdc
Maximum Reverse Voltage	0 Vdc

Notes:
1. Exceeding maximum ratings may damage the LED module and cause potential safety hazards.
2. Elevated operating temperatures can be expected to negatively impact the service life in terms of lumen output.

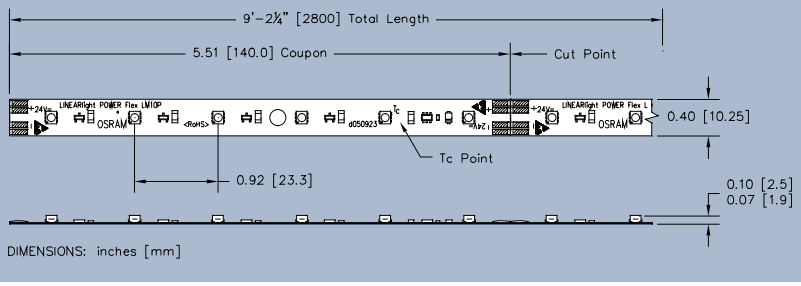
Accessories



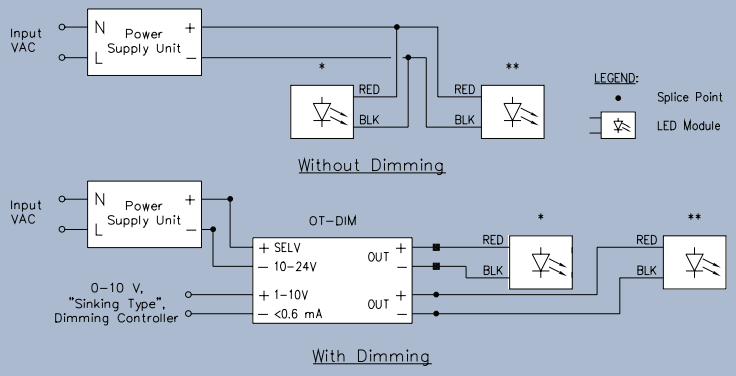
Item Number	Ordering Abbreviaion	Description	Length (in.)	Width (in.)	Wire Length (in.)	Lens	Order Qty.
70269	LM2PINFLEXCONN	Input Connector	20.21	0.64	19.69	—	10
70263	LM2CONN5FLEXCONNBB	Board to Board (short)	1.43	0.64	0.39	—	10
70131	LINEARlightFLEXCONNBB	Board to Board (long)	6	0.64	0.39	—	10
71236	LINEARlight Track 1.5P	Mounting Track	18	1.4	—	Prismatic	10
71237	LINEARlight Track 4.7P	Mounting Track	56	1.4	—	Prismatic	6
71238	LINEARlight Track 1.5D	Mounting Track	18	1.4	—	Diffuse	10
71239	LINEARlight Track 4.7D	Mounting Track	56	1.4	—	Diffuse	6

Note: For FLEX Connector installation instructions reference “FLEX Connectors User’s Guide” LED069 found at wwww.sylvania.com.

Assembly Diagram



Wiring Diagram



* For the 72 W modules, the maximum operable length on a single feed is 10 coupons.

* For the 48 W modules, the maximum operable length on a single feed is 20 coupons.

** Remaining load must be connected on subsequent power feeds.

Reference the “Power Supply Information” section of this PIB for module load per power supply requirements.

To help reduce the effects of any potential voltage drop, if possible, it is best to locate the power supply near the middle of the run.

Safety Information

WARNING: ONLY QUALIFIED PERSONNEL SHOULD PERFORM INSTALLATION.

TO AVOID ELECTRICAL SHOCK OR COMPONENT DAMAGE, DISCONNECT POWER BEFORE ATTEMPTING INSTALLATION OF THE POWER SUPPLIES AND/OR MODULES.

Failure to install the power supplies and/or LED modules in accordance with the National Electric Code (NEC), all applicable Federal, State and local electric codes as well as the specific Underwriters Laboratories (UL) safety standards for the installation, location and application may cause serious personal injury, death, property damage and/or product malfunction.

1. The LED module itself and all its components shall not be subjected to mechanical stress and assembly must not damage or destroy conducting paths on the circuit board.
2. Installation of LED modules shall be made with regard to all applicable electrical and safety standards. Only qualified personnel should be allowed to perform installations.
3. Observe correct electrical polarity, incorrect polarity may destroy the module. (Depending on the product, incorrect polarity may lead to emission of red, or no light.)
4. Ensure the power supply is of adequate power to operate the total load.
5. When mounting on metallic or otherwise conductive surfaces, an electrical isolation is required at soldering points between the module and the mounting surface.
6. Electrostatic Discharge (ESD) precautions shall be incorporated when handling or installing the module. (For more information, reference document # LED093 ESD Protection for LED Systems.)

Safety Information (continued)

7. The module, as manufactured, has no conformal coating and therefore offers no inherent protection against corrosion. The ability to customize the length of the module by cutting at specifically marked points is a key feature of the product and hence the reason for no factory installed conformal coating. For these reasons, it is recommended that the user complete all module modification first (cutting, wiring) and then apply a conformal coating in the final stages of installation.
8. Damage by corrosion and improper heat sinking will not be honored as a materials defect claim. It is the user's responsibility to ensure adequate heat sink and protection against corrosive agents such as moisture, condensation and other harmful elements.

Assembly Information

1. Solder connections should only be performed on designated solder pads (marked "24V +/-"). During soldering, do not exceed the maximum soldering time of 10 seconds and the maximum soldering temperature of 260°C.
2. The Smallest Electrical Unit (SEU) or "coupon" can be removed by cutting with scissors between the designated solder pads (reference "Assembly Diagram" for location).
3. The mounting of the module is facilitated by means of the double-sided adhesive on the back-surface of the module. Care must be taken to provide a clean and dry mounting surface, free of oils or silicone coatings as well as dirt particles. The mounting substrate must have sufficient structural integrity. Take care to completely remove the adhesive backing. Once the module is appropriately positioned, press on the module with about 20N/cm^2 (refer to application techniques of 3M adhesive transfer tapes).
4. The minimum bending radius is 2 cm. The module may be bent over a smaller radius but only in regions of the circuit board containing no electronic components. Such bends should be made only once and fixed in position to avoid cyclic fatigue.
5. The thermal expansion coefficient along the length of the module is 17 x 10^{-6}cm/cm/K. When installing in environments with large variations in temperature (e.g. outdoor applications) and operating length of more than 2m, the use of metallic mounting surfaces is necessary. Otherwise it is advisable to use an additional thicker adhesive tape to absorb the stress of any mismatch in expansion coefficients.
6. Installation of the LINEARlight POWER FLEX must include provisions for thermal management to avoid premature failure of the product and to obtain expected service life. Service life (i.e. lumen depreciation) is primarily a function of LED temperature, which is to be monitored on the circuit board at the designated "Tc point". (A Tc point temperature of 40°C should be sufficient to enable a service life of 50,000 hrs.)
7. Concerning fixture design, it is important to understand that once heat is transferred to a "heat sink", that heat must still be allowed to escape the "system". A heat sink transferring the thermal energy to the inside of an enclosed cavity may ultimately be of little use.
8. It is recommended that OEMs design a prototype fixture and test that fixture in an appropriate environment while monitoring the temperature at the Tc point, which should be allowed enough time to reach thermal equilibrium. Tc point temperature can be measured with a standard thermocouple in direct contact with the circuit board at the Tc point or by use of ML4C Series non-reversible OMEGALABELS (www.omega.com) or equivalent.
9. Definition of a UL 2108 listed Low Voltage Lighting System as it pertains to this module includes: 1. A UL Listed Class 2 power supply. 2. An appropriate number of OSRAM's LINEARlight POWER FLEX LED modules based on the recommended max number of modules listed. 3. The connectors/cable systems.

   The power supply must be mounted, wired, and grounded in accordance with all applicable NEC and ANSI standards.

   All modular connections on the secondary side of the power supply must be made using SYLVANIA connectors. If additional wires and/or splice connections are necessary, wires are to be UL Listed, minimum 22 AWG and splice connectors must be UL rated and chosen of appropriate size for number of wires to be connected. WARNING: the low voltage secondary circuit shall not be grounded.
10. For applications involving exposure to humidity and dust, the module must be protected by a fixture, or housing with a suitable protection class. The module can be protected against condensation by treatment with an appropriate circuit board grade conformal coating. The conformal coating should have the following features:

    a. Optical transparency
    b. UV – resistance
    c. Thermal expansion matching the thermal expansion of the module 15-30 x 10^-6cm/cm/K
    d. Low permeability of steam for all climate conditions
    e. Resistance against corrosive environment

This information shall not supersede the requirement to follow all other safety, assembly and any other instructions listed in this document.

The Acrylic Protective Lacquer (APL) from the company Electrolube (www.electrolube.com) has been tested and meets the conditions for this product (or equivalent). Please reference "Assembly Information" for any preparation instructions.

United States
OSRAM SYLVANIA
100 Endicott Street
Danvers, MA 01923

Trade
Phone: 1-800-255-5042
Fax: 1-800-255-5043

National Accounts
Phone: 1-800-562-4671
Fax: 1-800-562-4674

OEM/Special Markets
Phone: 1-800-762-7191
Fax: 1-800-762-7192

Display/Optic
Phone: 1-888-677-2627
Fax: 1-800-762-7192

Canada
OSRAM SYLVANIA LTD.
2001 Drew Road
Mississauga, ON L5S 1S4

Trade
Phone: 1-800-263-2852
Fax: 1-800-667-6772

OEM/Special Markets/Display/Optic
Phone: 1-800-265-2852
Fax: 1-800-667-6772

www.sylvania.com

www.sylvania.com

OPTOTRONIC®
Electronic 24V DC
LED Power Supplies

Power Supply Guide

OT6/100-120/24CE
OT17/120-277/24E
OT20/120-240/24S
OT30/120/24CORD
OT50/120/24LP
OT75/120-277/24E
OT96/120-277/24D
OT96/120-277/24
OT240/120-240/24/CH3

LED power supplies compatible with:
24V LED Modules

Key System Features

- Class 2 output
- Long life
- Short circuit and overload protection
- Remote mounting possible
- OT6, OT17, & OT75 models are rated for outdoor, damp locations
- OT96 & OT240 models are IP66 rated for wet locations

Application Information

OSRAM OPTOTRONIC
power supplies are ideally suited for:

- Low & medium power applications
- Signs
- Compact installations
- Path and roadway marking
- Backlighting
- Step and seat marking
- Effect lighting
- Panel lighting
- Ambience lighting inside furniture
- Wall washing
- General lighting

OSRAM OPTOTRONIC power supplies are compact and electronically stabilized. The wide range of input voltage, on select models, from 100 to 277 VAC enables worldwide use on single-phase AC power lines. These supplies are available with 24VDC outputs.

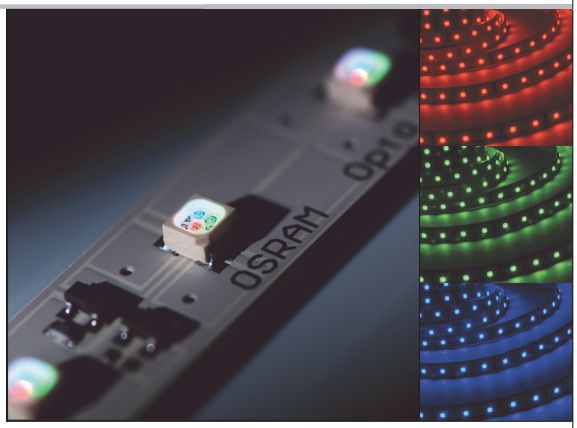
OPTOTRONIC power supplies are protected against open circuit, short circuit, overload and overheating conditions. They meet the highest industry standards.

System Information

OSRAM SYLVANIA has introduced a full line of LED modules (Light Emitting Diodes) and power supply products.

LED modules can be used in a wide variety of applications due to our variable module design, module geometries, and range of available colors.

The LEDs are available in many different configurations to meet the demands of these applications. For additional information about OSRAM LED systems, contact OSRAM SYLVANIA or visit www.sylvania.com/LED.



ECS050R10 – 9/2009

SEE THE WORLD IN A NEW LIGHT SYLVANIA

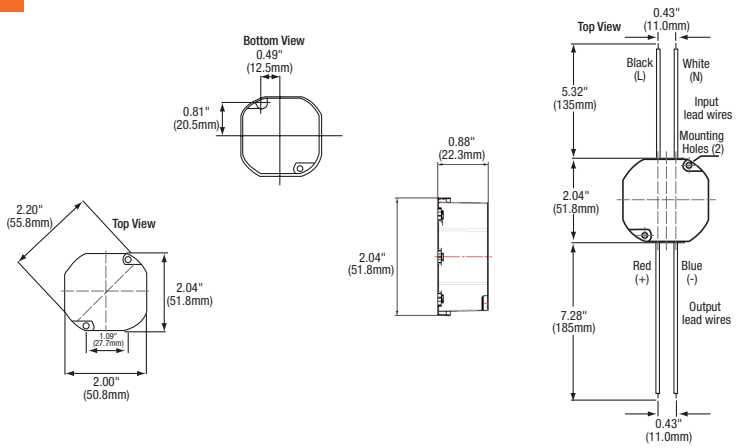
OPTOTRONIC® 24V DC SUPPLIES

Electronic LED Power Supplies

OT6 Case

Packaging:
Quantity: 20 pieces/carton
Weight: 0.16 lbs each (approx.)
3.72 lbs/carton

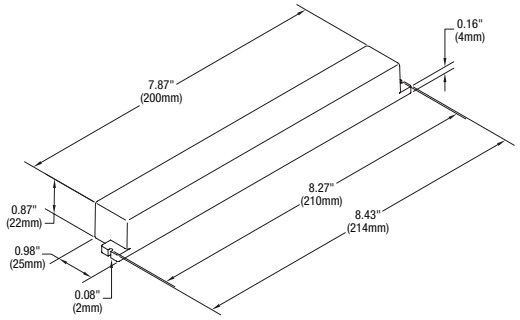
Wiring: Leads only
(no connectors)
Input: (18AWG wire)
Output: (18AWG wire)



OT17 Case

Packaging:
Quantity: 50 pieces/carton
Weight: 0.36 lbs each (approx.)
18.3 lbs/carton

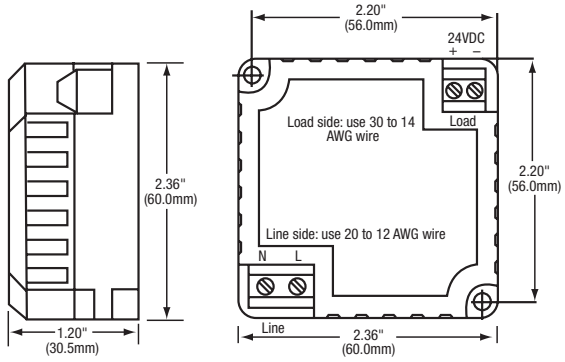
Wiring: Leads only (no connectors)
Input: 6" (18AWG wire) black & white wires
Output: 6" (18AWG wire)
gray+ & black– wires



OT20 Case

Packaging:
Quantity: 30 pieces/carton
Weight: 0.21 lbs each (approx.)
6.30 lbs/carton

Wiring: Connectors only
(No leads provided) Use solid
or stranded copper wire only



For complete power supply and LED module details, refer to the OSRAM SYLVANIA LED Systems Specification Guide or go to www.sylvania.com

SEE THE WORLD IN A NEW LIGHT SYLVANIA

OPTOTRONIC® 24V DC SUPPLIES (DC OUTPUT)

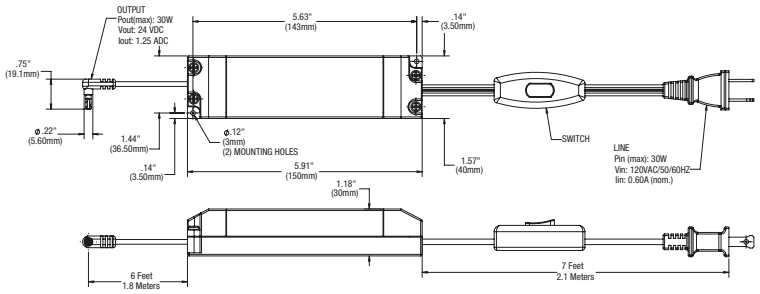
Electronic LED Power Supplies

Item Number — **51503 OT 6/ 100-120/ 24 CE** — Circular External *
OPTOTRONIC — Output Voltage (DC)
Output Wattage (6 watts) — Input Voltage (AC)

* Additional descriptors are as follows:
CE = Circular External, CH3 = 3 Channels, D = Indoor, E = External, LP = Low Profile, S = Square

OT30 Case

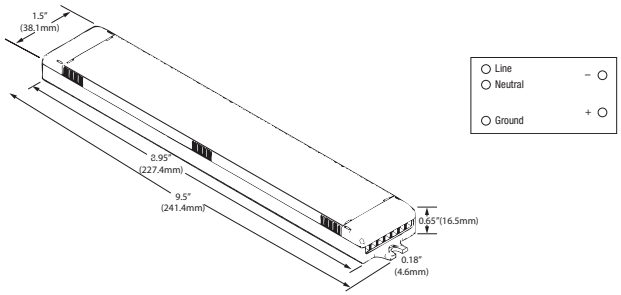
Packaging:
Quantity: 50 pieces/carton
Weight: 0.63 lbs each (approx.)
31.77 lbs/carton



OT50 Case

Packaging:
Quantity: 20 pieces/carton
Weight: 0.4 lbs each (approx.)
8.5 lbs/carton

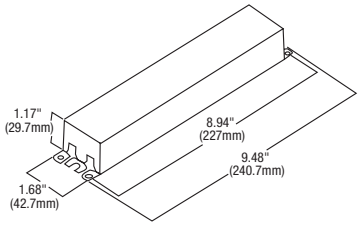
Wiring: Connectors only
(No leads provided)
Use 14-22AWG solid or
stranded copper wire only



OT75 Case

Packaging:
Quantity: 10 pieces/carton
Weight: 1.35 lbs each (approx.)
14 lbs/carton

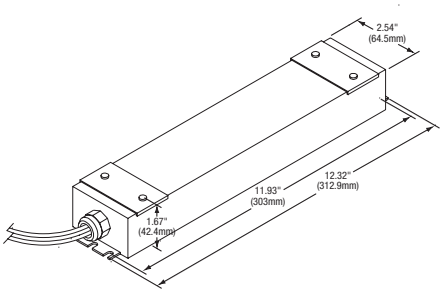
Wiring: Leads only (no connectors)
Input: 9" (18AWG wire) black & white wires
Output: 9" (18AWG wire)
red+ & blue– wires



OT96 Case (Wet Rated)

Packaging:
Quantity: 16 pieces/carton
Weight: 2 lbs each (approx.)
33 lbs/carton

Wiring: Leads only (2.76" 18AWG wire)
Input: Black (L), White (N), & Green/Yellow (GRD) wires with a UL Listed, 1/2" Metallic fitting
Output: Gray (+) & Black (–) with a UL Listed, 1/2" plastic fitting



Specifications subject to change without notice.

the system solution®

SPECIFICATION DATA

Catalog #	Date	Type
Project	Prepared by	
Comments		

OPTOTRONIC LED Power Supplies (DC Output)

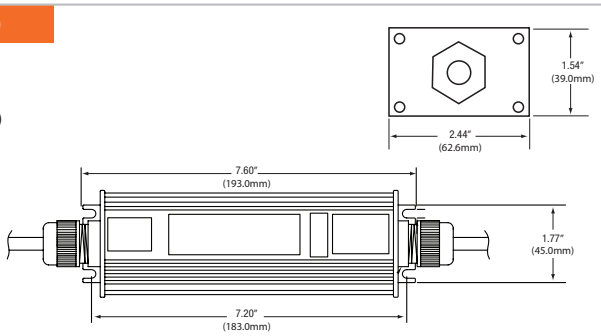
Item Number	Description	Nominal Input Voltage (VAC)	Nominal Input Current (Amps)	Power Factor	Nominal Input Power (W)	Output Voltage (VDC)	Output Power Range (W)	Max. Line Ripple (V)	UL/ETL file#	Location Rating
51503	OT6/100-120/24CE	120	0.11	0.55	7.1	24.0±0.5	0.9-6	±0.2V	E258264	Damp
51622	OT17/120-277/24E	120 277	0.19 0.10	0.92	21	24.0±0.5	0.8-17	±1.0V	E220096	Damp
51512	OT20/120-240/24S	120 240	0.38 0.19	0.5	23	24.0±1.0	0.9-20	±0.2V	E258264	Dry
51521	OT30/120/24CORD	120	0.63	0.5	38	24.0±1.0	1-30	±1.5V	3137489	Dry
51598	OT50/120/24LP	120	0.47	0.99	56	24.0±0.5	0.9-50	±0.2V	E248522	Dry
51514[3]	OT75/120-277/24E	120 277	0.76 0.33	0.99	90	24.0±0.5	0.9-75	±0.2V	E258264	Damp
51510	OT96/120-277/24D	120 277	0.91 0.39	0.99	108	24.0±0.5	0.8-96	±1.0V	E220096	Dry
51511	OT96/120-277/24	120 277	0.91 0.39	0.99	108	24.0±0.5	0.8-96	±1.0V	E220096	WET[2]
51515	OT240/120-240/24/CH3	120 240	2.39 1.19	0.99	285	24.0±0.5	0.8-240	±1.0V	E220096	WET[2]

1: All power supplies can be remote mounted up to 32 feet. Although it is possible to exceed the remote mounting distance, the installer and/or end user must take precautions to prevent and/or test the effects of EMI (electromagnetic interference).
2: Use wiring rated and marked PLTC, CL3R, and "sun resistant"
3: 51514 replaces 51513 (OT75/120/24), which is discontinued

OT96 Case (Dry Rated)

Packaging:
Quantity: 20 pieces/carton
Weight: 1.6 lbs each (approx.)
33 lbs/carton

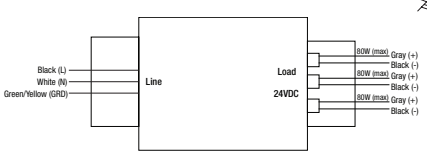
Wiring: Leads only
(12" 18AWG wire)
Input: Black (L), White (N),
& Green/Yellow (GRD)
Output: Red (+) & Black (–)

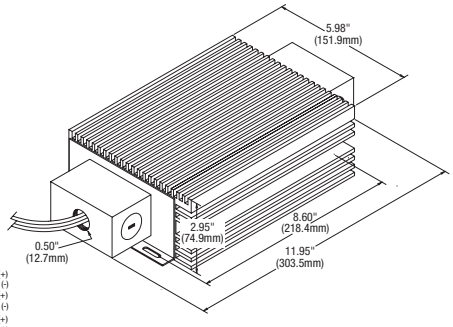


OT240 Case

Packaging:
Quantity: 5 pieces/carton
Weight: 11 lbs each (approx.)
53 lbs/carton

Wiring: Leads only
(6.9" 18AWG wire)





OPTOTRONIC®

24V DC LED Power Supplies

Specifications

Class 2 Outputs
Input Voltage Range (Min/Max):
OT6: 90 - 132 VAC
OT20 & OT240: 108 - 254 VAC
OT30 & OT50: 108 - 132 VAC
OT17, OT75 & OT96: 100 - 305 VAC
Input Frequency: 50/60Hz
Ambient Temp. Range:
-20°C through +50°C
OT30: -20°C through +45°C
OT75/120-277: -25°C through +60°C
OT17, OT96 & OT240: -30°C through +70°C
Max. Case Temp:
OT30: 45°C
OT6, OT50: 70°C
OT20: 75°C
OT17, OT75, OT96 & OT240: 90°C

OT6, OT17, OT20, OT75: UL 1310, UL48 Recognized for US & Canada Class 2 Unit
OT96 & OT240: UL48 Recognized for US & Canada Class 2 Unit
OT50: UL1310 Recognized for US & Canada Class 2 Unit

OT30: ETL listed and conforms to UL1310

OT6, OT75 are CSA approved
FCC 47CFR Part 15 compliant RoHS compliant

Life / Warranty

OPTOTRONIC LED Power Supply Products are covered by our OPTOTRONIC power supply warranty. For additional details, refer to our latest version of the warranty bulletin.

OSRAM SYLVANIA
National Customer
Service and Sales Center
1-800-LIGHTBULB
(1-800-544-4828)
www.sylvania.com

Specifications subject to change without notice.

Job Name Here	Fixture Type Here	Ordering Information Here

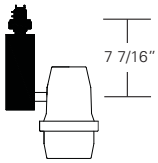
MHLN203 SERIES • 120/277V • PAR20

The MHLN203 series is a specification grade spotlight whose high intensity and light weight make it perfect for retail, display, exhibit and residential interiors.

- Designed for 39 watt medium screw base PAR20 Metal Halide lamps
- Can be configured for use on 120V or 277V systems
- Sturdy aluminum housing
- Self-locking swivel for horizontal and vertical focusing
- On/off safety switch (on most mounting types)
- Relamping handle for easy lamp changing
- Internal multiple accessory clips accept size-AA LSI filters and accessories
- Removable cross-baffle eliminates glare (45 degree cutoff)
- Extruded aluminum ballast housing with integral 120V or 277V thermally protected electronic ballast for 39 watt Metal Halide lamp. (7 11/16"H x 2"W x 2 7/8"D)
- Finishes: LSI Black, White, Silver and Graphite
- Fixture weight: 2.5 LB
- IBEW

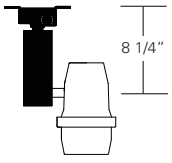
MOUNTING OPTIONS

MHLN203-00
Lexan Fitting for 1 and 2 circuit LSI Track. With on/off switch.

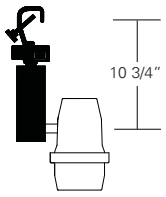


MHLN203-00F
Same as above, with fuse.

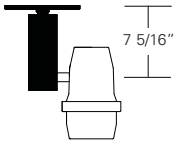
MHLN203-2G
Universal fitting for Unistrut Systems and any screw or bolt-up applications. With switch, 6-foot 3-wire grounding cord and plug.



MHLN203-3G
C-clamp for pipes from 5/8" to 2" O.D. With switch, 6-foot 3-wire grounding cord and plug.



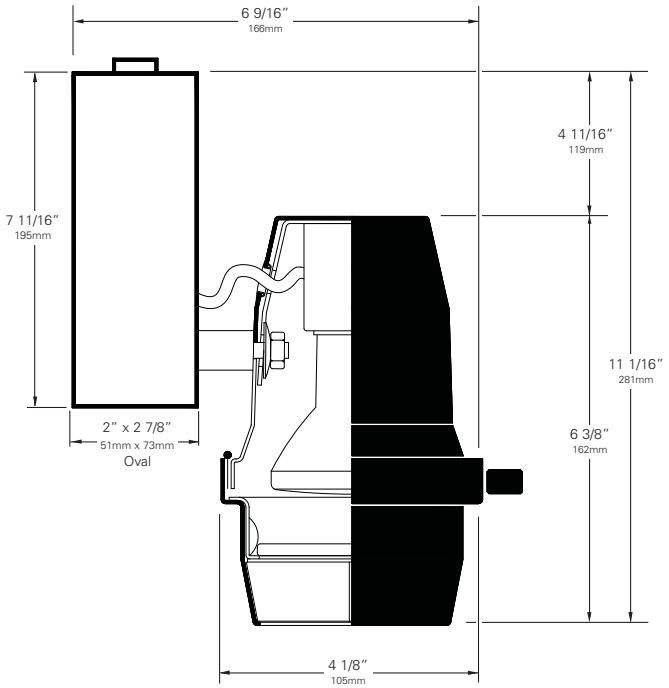
MHLN203-5A
Canopy for permanent mounting on standard 4" octagonal outlet box.



Other Options (Consult Factory):
- Stems, specify length
- Custom color, RAL palette

06/09 www.LightingServicesInc.com

Job Name Here	Fixture Type Here	Ordering Information Here



ORDERING INFORMATION

1. Select your **Mounting Option.**
2. If a 277V unit is required, add **V** before the unit number.
3. Choose other fixture **Options** (add suffix):
   - For Coiled Cord, add **CC**

   Coiled Cord is 18/3 105ºC, 18" retracted, 6 foot extended. White fixtures are supplied with white cord, all other finishes are supplied with black cord. Available only with **2G** and **3G** mounting options. (When a coiled cord is not specified, a straight cord is provided.)
   - For Wrench Locking, add **WL**
4. Choose a **Finish** for your fixture:
   Black (**B**) White (**W**) Silver (**S**) Graphite (**G**)

   Example: V MHLN203 – 2G CC WL B
   (277 VOLT · FIXTURE · FITTING · COILED CORD · WRENCH LOCKING · FINISH)

   Blue fields are optional. Leave blank if not required.
5. Don't forget your **Accessories!**
   LSI features the widest range of accessories in the industry to help you modify the light's intensity, color, texture and pattern.

PAR20 LAMPS

Watts	Spread	CBCP	
39	10°	23000	CDM35/PAR20/M/SP
39	30°	5000	CDM35/PAR20/M/FL
39	12°	20000	CMH39/PAR20/830/SP12
39	30°	5000	CMH39/PAR20/830/FL30

Click for detailed photometrics

BALLAST TYPE (Electronic)

ANSI Specification	M130
Maximum Input Current	120/.37, 277/.17
Input Power	120/44W, 277/46W
Power Factor	>95%
THD	<10%, Nominal 6%

ACCESSORIES

Glass Color Filters AA
Selection of 95 permanent framed dichroic and framed and slotted standard colors.

Other accessories:

- **Louver Hex AA**
- **Spread Lenses AA990, AA992, AA995, AA996**
- **Beam Softener AA998**
- **Light Blocking Screens AA801S, AA802S, AA803S**
- **OPTIVEX™ UV Filter AA962**

Click for complete accessories and descriptions

Job Name Here	Fixture Type Here	Ordering Information Here

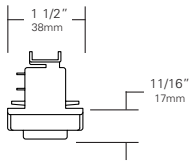
MOUNTING OPTIONS

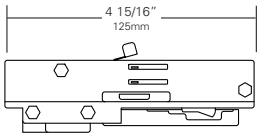
-00 LSI Track Fitting

00 LSI Track Fitting—Low profile Lexan fitting for 1 and 2 circuit LSI Track. Integral on/off switch and mechanical safety interlock for positive nonenergized making and breaking of fixture contacts with track. Available in Black, White, Silver, and Graphite Lexan to match fixture housings and track. Weight limit for ceiling mount is 15lbs., weight limit for wall mount is 10lbs.

00F—Same as above with fuse. 5 13/16" overall length.

00FIT- (Fitting Only)—UL Listed low profile Lexan fitting for 1 and 2 circuit LSI Track sold to any end user or manufacturer so that a pendant light, theatrical fixture, or any other lighting instrument can be powered by LSI Track. For ease of installation, -00FIT can be ordered with or without 18" cable. Integral on/off switch and mechanical safety interlock for positive non-energized making and breaking of fixture contacts with track and is available in Black, White, Silver, and Graphite or can be custom painted to match fixture. Weight limit for ceiling mount is 15lbs, weight limit for wall mount is 10lbs. Max Voltage: 120V, Max Amperage: 5A, Max Temperature: 80°C, Max Wattage: 600W

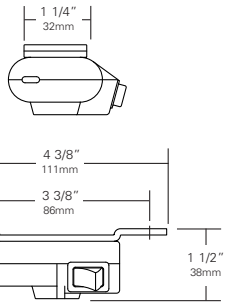




Click here for -00FIT installation instructions/ordering information

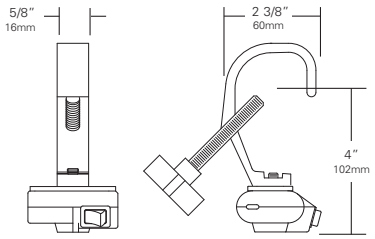
-2G Universal Flange Fitting

2-hole (0.25 diameter) flanged steel plate for any screw or bolt-up application. Integral on/off switch with 6-foot 3-wire grounding cord and NEMA 5-15 plug (120V) or NEMA 7-15 plug (277V) where applicable. Available in LSI Black, White, Silver, and Graphite paint finish to match fixture housings. White finish supplied with white cord, all other finishes supplied with black cord. Coiled cord available as an option.



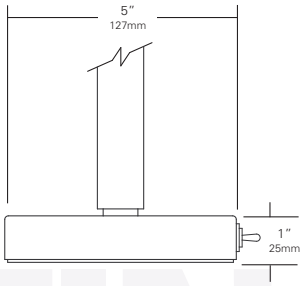
-3G Pipe Clamp Fitting

Extruded aluminum theatrical pipe clamp for pipes from 5/8" to 2" O.D. Integral on/off switch with 6-foot 3-wire grounding cord and NEMA 5-15 plug (120V) or NEMA 7-15 plug (277V) where applicable. Available in LSI Black, White, Silver, and Graphite paint finish to match fixture housings. White finish supplied with white cord, all other finishes supplied with black cord. Coiled cord available as an option.



-4G Portable Weighted Base

Cushioned iron weighted base for floor or table use. Integral on/off switch with 6-foot 3-wire grounding cord and NEMA 5-15 plug (120V) where applicable. Available in LSI Black, White, Silver, and Graphite paint finish to match fixture housings. White finish supplied with white cord, all other finishes supplied with black cord. Coiled cord available as an option. Non-UL listed.



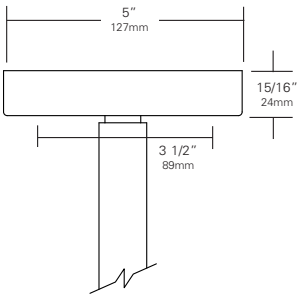
MOUNTING

Job Name Here	Fixture Type Here	Ordering Information Here

MOUNTING OPTIONS

-5 Canopy Fitting

5 Canopy Fitting—15/16" deep by 5" diameter steel canopy for permanent mounting on standard 4" electrical octagonal outlet box. Fixture supplied with 6" hi-temp leads ready for splicing. No switch. Available in LSI Black, White, Silver, and Graphite paint finish to match fixture housings.



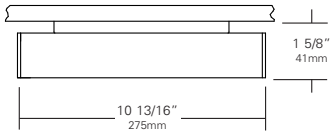
5A Canopy Fitting—Same as above with 5/16" depth.

5E Canopy Fitting—Same as above with integral transformer for certain low voltage fixtures. See specific catalog sheets.

Unimount

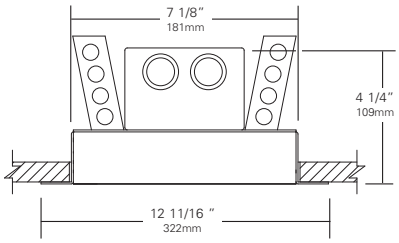
Unimount, Surface Track—Single fixture mounting which attaches to standard flush electrical outlet box. Accepts most single LSI track-mounted fixtures with -00 and -00F fitting. Wired with 6" of high temperature wire for 500 watt maximum, single circuit. Available in LSI Black, White, Silver, and Graphite paint finish to match fixture housings.

Surface



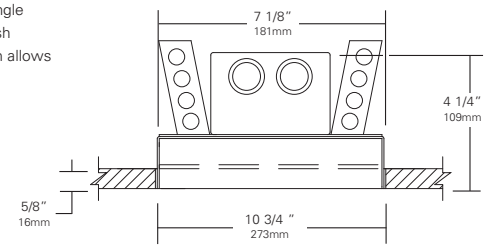
120V Recessed Flanged Unimount—A compact Recessed Track assembly which will accept most single LSI Track fixtures up to 500 watts. Two piece construction allows for wiring and inspection. White finish.

Recessed - Flanged



120V Recessed Flangeless Unimount—A compact Recessed Track assembly which will accept most single LSI Track fixtures up to 500 watts. Created to be flush mounted into 5/8" sheetrock. Two piece construction allows for wiring and inspection. White finish.

Recessed - Flangeless



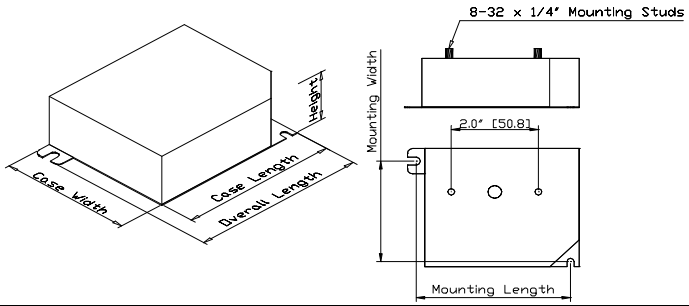
PHILIPS ADVANCE

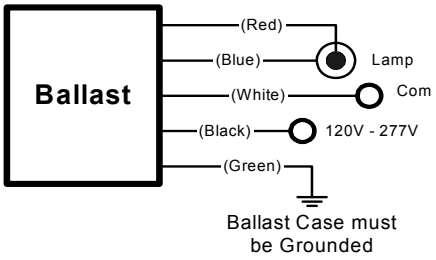
e-Vision® Electronic Ballast for Metal Halide Lamps

Catalog Number: IMH-39-G
For 39W Metal Halide Lamps
ANSI M130
120-277 50/60Hz Electronic
Status: RELEASED

DIMENSIONS AND DATA

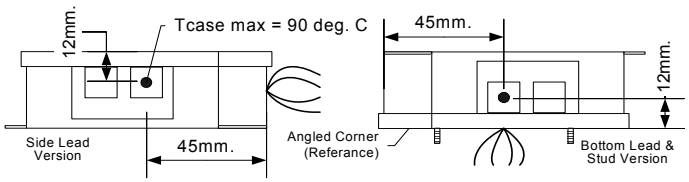
Lamp Number	Lamp Watts	Input Volts	Catalong Number*	Line Current (Amps)	Input Power (Watts)	Min Power Factor	Wiring Diag	Fig.	Weight (lb)	Max. Distance to Lamp (ft)
39W Watt Lamp, ANSI Code M130 Minimum Starting Temp -30°C/-20°F										
1	39	120	IMH-39-G-XXX	0.39	46	0.9	3	G	0.9	5
		277		0.18	45					





Wiring Diagram 3

Case Figure	Overall Length	Case Length	Case Width	Height	Mountin Length	Mounting Width
G	97mm [3.8"]	90mm [3.5"]	77mm [3.0"]	30mm [1.2"]	87mm [3.4"]	67mm [2.6"]



Case Temperature Measurement Location

INSTALLATION & APPLICATION NOTES:

1. Maximum allowable case temperature is 90°C. See figure above for measurement location
2. Ignition pulse is 4 kV max
3. All leads are 9 inches long
4. Ballast output will shutdown after 20 minutes if lamp fails to ignite
5. Power must be cycled off – then on, after replacing lamp
6. Connect the red lead to the center terminals of the lamp when using screw base lamps

***Ordering Information**

Order Suffix	Description
-LF	Ballast with side exit leads and mounting feet
-BLS	Ballast with bottom exit leads and mounting studs

Data is based on tests performed by Philips Advance in a controlled environment and is representative of relative performance. Actual performance can vary depending on operating conditions. Specifications are subject to change without notice. All specifications are nominal unless otherwise noted.

Philips Lighting Electronics N.A.
10275 West Higgins Road • Rosemont, IL 60018 • www.philips.com/advance
Tel: 800-322-2086 • Fax: 800-423-1882 • Customer Support: 800-372-3331 • OEM Support: 866-915-5886

MasterColor CDM 35W/ 830 Med PAR20 FL 1CT

Product family description

Range of compact, high-efficiency, ceramic metal halide reflector lamps with a stable color over lifetime and a crisp, sparkling light.

Features/Benefits

- Excellent color rendering.
- Superior color stability over life within +- 200K.
- Lamp to lamp color consistency over life.
- Warm (3K) color impression.
- High lamp efficacy (up to 93 lumens per watt) for energy saving and low heat.
- Universal operating position, suitable for open fixtures.
- High beam intensities from unique compact reflector design.
- FadeBlock for reduced fading risks.
- Long lamp life compared to incandescent and halogen lamps.

Applications

- Ideal for retail accent and display lighting; architectural lighting.

Notes

- Requires a ballast specified or approved for Philips Metal Halide lamp or one designed to the indicated ANSI Standard. A pulse ignitor is required. Sockets and wiring must withstand starting pulse. (391)
- Supply volts must be +/- 5% of rated ballast line volts for reactor type and +/- 10% for CWA or electronic ballasts. (392)
- UV filtered design (FadeBlock™). (396)
- Operate only on thermally protected ballasts (397)
- MasterColor® Metal Halide Lamps are not recommended for use on dimmers and are not warranted if used on dimmer systems. (401)
- Rated average life is the life obtained, on the average, from large representative groups of lamps in laboratory

PHILIPS

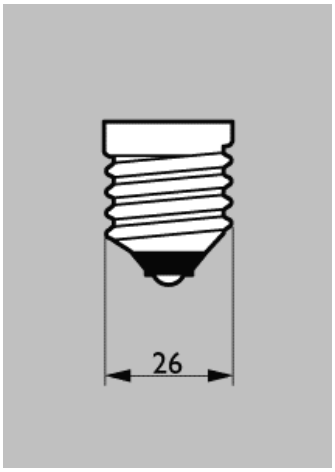
tests under controlled conditions at 10 or more operating hours per start. It is based on survival of at least 50% of the lamps and allows for individual lamps or groups of lamps to vary considerably from the average. For lamps with a rated average life of 24,000 hours, life is based on survival of 67% of the lamps. (351)

- Approximate lumen values listed are for vertical operation of the lamp. (352)
- Means Lumens is the approximate lumen output at 40% of lamp rated average life. (353)

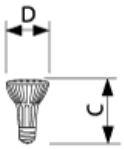
Product data	
Product Number	233643
Full product name	MasterColor CDM 35W/830 Med PAR20 FL 1CT
Ordering Code	CDM 35/PAR20/M/FL
Pack type	1 Lamp in a Folding Carton
Pieces per Sku	1
Skus/Case	12
Pack UPC	046677233648
EAN2US	
Case Bar Code	50046677233643
Successor Product number	
Base	Medium [Single Contact Medium Screw]
Base Information	Nic/Brass [Nickel/Brass Base]
Bulb	PAR20 [PAR 2.5 inch]
Bulb Material	Hard Glass
Bulb Finish	Reflector
Operating Position	Universal [Any or Universal (U)]
Packing Type	1CT [1 Lamp in a Folding Carton]
Packing Configuration	12
RatedAvgLife(See Family Notes)	9000 hr
Feature	FadeBlock™
Ordering Code	CDM 35/PAR20/M/FL
Pack UPC	046677233648
Case Bar Code	50046677233643
ANSI Code HID	M130/O
Watts	35W
Lamp Voltage	88 V
Mercury (Hg) Content	2.8 mg
Picogram per Lumen Hour	239 p/LuHr
Beam Description	Flood [Flood]
Beam Angle	30D
Approx. MBCP	5000 cd
Color Code	830 [CCT of 3000K]
Color Rendering Index	81 Ra8
Color Temperature	3000 K
Initial Lumens	2000 Lm
Design Mean Lumens	1300 Lm
Max Overall Length (MOL) - C	3.75 in
Diameter D	2.480 in
Product Number	233643

PHILIPS

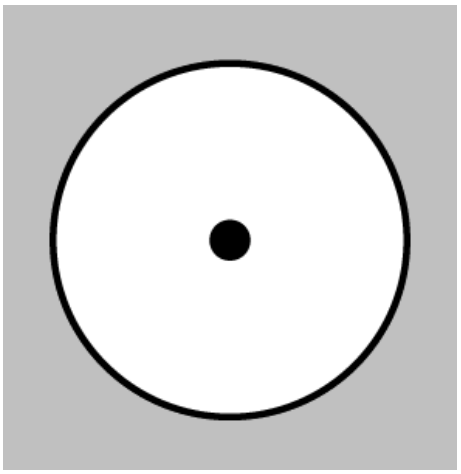
CDM PAR20 FL



Base Medium



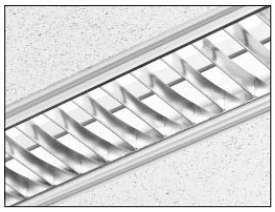
CDM PAR20



Operating Position Universal

M100 Recessed Linear Fluorescent Slot Grid / Thick Ceiling Panel

se'lux®



Project: _____ **Type:** _____ **Qty:** _____

M10	– 1T5	– SD	– SG	– 004	– WH	– 277	–
Fixture Series	**Lamp Type**	**Shielding**	**Mounting**	**Nominal Length**	**Finish**	**Voltage**	

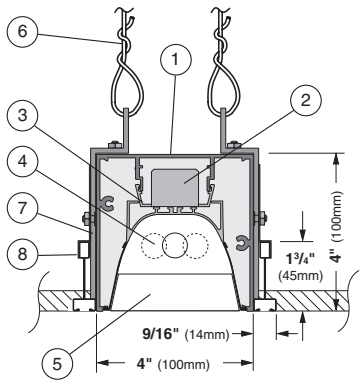
DM – _____ – _____ – _____ – _____ – _____ – _____ – _____ – _____

Options (refer to separate data sheets for ordering codes and details)

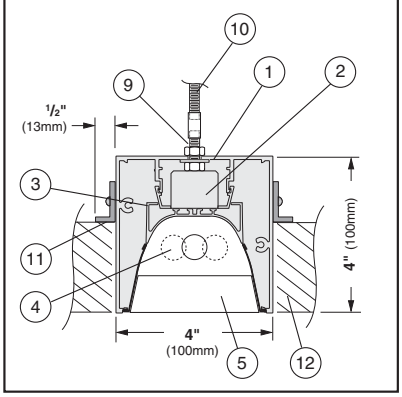
Fixture Series	Lamp Type	Shielding	Mounting	Nominal Length	Finish	Voltage	Options
M10 M100 Recessed Multi-Mount Form	**1T5** F28T5 **2T5** (2x)F28/T5 **1T5HO** F54T5HO **1T8** F032/T8	**SA** Specular Parabolic **MA** Matte Parabolic **MP** Silky Specular Parabolic **PL** Matte Perforated Parabolic **SD** Satine Lens **OD** Extra Diffuse Lens **X** None	**SG** Slot Grid[1] **DC** Ceiling Panels up to 2" thick (lengths per submittal drawings)	**004** 4 foot **008** 8 foot **012** 12 foot For actual lengths see following page. For other lengths, configurations indicate nominal length rounded to the next highest foot. Factory will supply layout drawings. Individual fixtures cannot be field joined.	**WH** White **BK** Black **SV** Silver **SP** Specify RAL#	**120** **277** **347**	(qty.)**EM** Stand-by Battery Pack[2] (prefix quantity, i.e. - **5EM**) **FS** Single Fusing **DM** Dimming[2] (specify system) **DMA** Digital Addressable Dimming[2] **SI** Satine Acrylic Inlay[4] **FW** Flex Whip (standard) **FW1** Flex Whip (dimming) **Track** Eutrac Standard[3] **DL** Suitable for Damp Locations **CCEA** Chicago Plenum **Downlights** (See MR16 spec sheets, pp.98-99)

[1]T5 & T5HO lamps only, consult factory for other lamps. [2]Must be low profile ballasts (1½" W x 1 3/16" H); consult factory for details. [3]Consult factory for details. [4]SA, MA, MP & PL shieldings only.

Slot Grid (SG) Scale = 1 : 4



Ceiling Panels up to 2" thick (DC) Scale = 1 : 4



1. Housing - Continuous, 6063-T5 extruded aluminum profile up to 16 feet long. Joined with Connector Plus Joining System for ease of installation and to assure a uniform appearance.

2. Ballast - Electronic, high power factor, class "P", type "A" sound rating. Specify 120v, 277v, or 347v. Ballast is factory pre-wired with leads to one end of fixture. Consult factory for ballast options.

3. Gear Tray - Extruded aluminum,with white painted finish. Gear tray installed as a complete electrical unit and is held in place with knurled dress nuts. It is fully accessible from below ceiling.

4. Lamps - As noted (by others). Other lamp lengths or wattages available, consult factory.

5. Shielding - Louvers offer excellent glare control in longitudinal, lateral, and all diagonal planes. High quality aluminum louvers and acrylic shielding allow true freedom of layout for today's modern spaces.

6. Support wire to structure - Supplied and installed by others.

7. Support bracket - Supplied nominally every four feet.

8. Slot grid beam and cross tees - Supplied and installed by others.

9. Pre-installed 1" 1/4-20 Stud - Attached to fixture every nominal 4 feet.

10. Coupling and Threaded Rod to Structure - Supplied and installed by others.

11. Aluminum angle brackets - Run entire length of fixture to block view into plenum area from below fixture.

12. Ceiling Panels up to 2" thick - Supplied and installed by others. Suitable for Decoustic® ceiling panel installations. Other ceiling systems possible, please consult factory. Decoustic® is a registered trademark of Decoustics Ltd. Corporation.

Interior Luminaire Finish - Standard interior colors are White (WH), Black (BK) and Silver (SV). RAL colors (SP) are available, please

TEL: (845) 691-7723
FAX: (845) 691-6749
www.selux.com/usa
M10_SG-01 (v5.0)

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Union Made Affiliated with **IBEW** *Local 363*

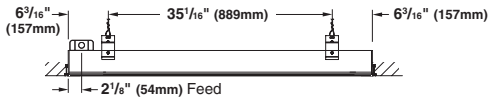
M100 Recessed Linear Fluorescent Slot Grid / Thick Ceiling Panel

M10 Slot Grid Layout Dimensions

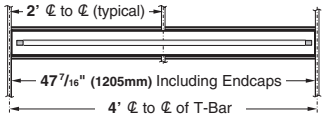
For T5 and T5HO lamps only, for other lamping consult factory.

Nominal 4 foot Individual

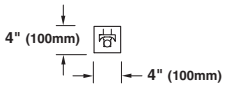
Side View



Bottom View

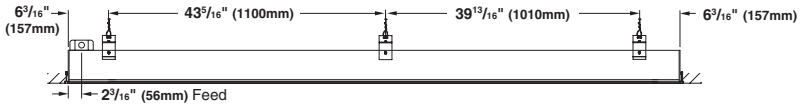


Typical End View (all lengths)

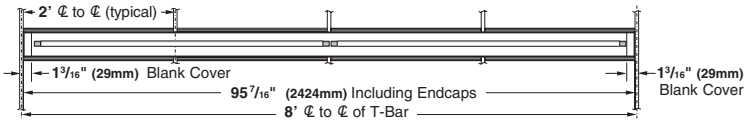


Nominal 8 foot Individual

Side View

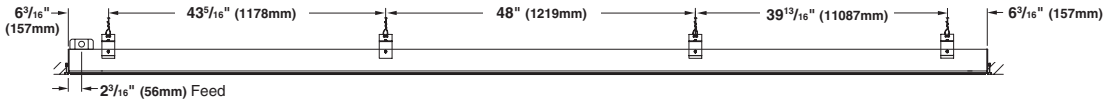


Bottom View

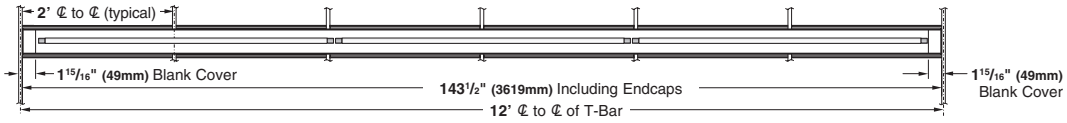


Nominal 12 foot Individual

Side View



Bottom View



Fixture supplied with 7/8 knockout located 2 3/16" from end in top of fixture.

For other lengths, lamping, continuous runs or configurations please specify overall length (in feet), accessories desired and sketch/drawing of configuration. SELUX will detail project drawings upon order and supply submittal drawings for approval. Individual fixtures cannot be field joined. If you have any questions please contact SELUX customer service or applications engineering for assistance (1-800-SELUX-CS).

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E-mail: seluxus@selux.com / Web Site: www.selux.com/usa
M10_SG-02 (02/06)

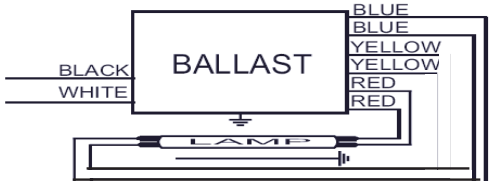
PHILIPS ADVANCE

ICN-2S28-N@120	
Brand Name	CENTIUM T5
Ballast Type	Electronic
Starting Method	Programmed Start
Lamp Connection	Series
Input Voltage	120-277
Input Frequency	50/60 HZ
Status	Active

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (ANSI Watts)	Ballast Factor	MAX THD %	Power Factor	MAX Lamp Current Crest Factor	B.E.F.
F14T5	1	14	0/-18	0.14	17	1.07	10	0.98	1.7	6.29
F14T5	2	14	0/-18	0.28	33	1.04	10	0.98	1.7	3.15
F21T5	1	21	0/-18	0.22	25	1.06	10	0.98	1.7	4.24
F21T5	2	21	0/-18	0.39	49	1.02	10	0.98	1.7	2.08
* F28T5	1	28	0/-18	0.29	31	1.05	10	0.98	1.7	3.39
F28T5	2	28	0/-18	0.53	62	1.00	10	0.98	1.7	1.61

Wiring Diagram



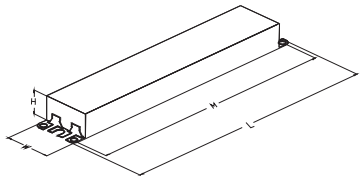
The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

	in.	cm.
Black	23	58.4
White	23	58.4
Blue	27	68.6
Red	27	68.6
Yellow	42	106.7
Gray		0
Violet		0

	in.	cm.
Yellow/Blue		0
Blue/White		0
Brown		0
Orange		0
Orange/Black		0
Black/White		0
Red/White		0

Enclosure



Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
9.5 "	1.3 "	1.0 "	8.9 "
9 1/2	1 3/10	1	8 9/10
24.1 cm	3.3 cm	2.5 cm	22.6 cm

Revised 09/14/2009

Data is based upon tests performed by Philips Lighting Electronics N.A. in a controlled environment and is representative of relative performance. Actual performance can vary depending on operating conditions. Specifications are subject to change without notice. All specifications are nominal unless otherwise noted.

PHILIPS LIGHTING ELECTRONICS N.A.
10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018
Tel: 800-322-2086 · Fax: 888-423-1882 · www.philips.com/advance
Customer Support/Technical Service: 800-372-3331 · OEM Support: 866-915-5886

PHILIPS ADVANCE

ICN-2S28-N@120	
Brand Name	CENTIUM T5
Ballast Type	Electronic
Starting Method	Programmed Start
Lamp Connection	Series
Input Voltage	120-277
Input Frequency	50/60 HZ
Status	Active

Electrical Specifications

Notes:

Section I - Physical Characteristics

1.1 Ballast shall be physically interchangeable with standard electromagnetic or standard electronic ballasts, where applicable.

1.2 Ballast shall be provided with integral leads or poke-in wire trap connectors color-coded per ANSI C82.11.

Section II - Performance Requirements

2.1 Ballast shall be Programmed Start.

2.2 Ballast shall contain auto restart circuitry in order to restart lamps without resetting power.

2.3 Ballast shall operate from 50/60 Hz input source of _____ (120V through 277V or 347V through 480V) with sustained variations of +/- 10% (voltage and frequency) with no damage to the ballast.

2.4 Ballast shall be high frequency electronic type and operate lamps at a frequency above 42 kHz to avoid interference with infrared devices and eliminate visible flicker.

2.5 Ballast shall have a Power Factor greater than 0.98 for primary lamp.

2.6 Ballast shall have a minimum ballast factor of 1.00 for primary lamp application.

2.7 Ballast shall provide for a Lamp Current Crest Factor of 1.7 or less in accordance with lamp manufacturer recommendations.

2.8 Ballast input current shall have Total Harmonic Distortion (THD) of less than 20% for Standard models and THD of less than 10% for Centium models when operated at nominal line voltage with primary lamp.

2.9 Ballast shall have a Class A sound rating.

2.10 Ballast shall have a minimum starting temperature of _____ {-18C (0F) or -29C (-20F)} for primary lamp. Consult lamp manufacturer for temperature versus light output characteristics.

2.11 Ballast shall provide Lamp EOL Protection Circuit.

2.12 Ballast shall tolerate sustained open circuit and short circuit output conditions without damage.

2.13 Ballast shall have a hi-low switching option when operating (4) F54T5/HO lamps to allow switching from 4-2 lamps, 3-2 lamps or 3-1 lamp.

2.14 Four-lamp ballast shall have semi-independent lamp operation.

Section III - Regulatory Requirements

3.1 Ballast shall not contain any Polychlorinated Biphenyl (PCB).

3.2 Ballast shall be Underwriters Laboratories (UL) listed, Class P and Type 1 Outdoor; and Canadian Standards Association (CSA) certified where applicable.

3.3 Ballast shall comply with ANSI C62.41 Category A for Transient protection.

3.4 Ballast shall comply with ANSI C82.11 where applicable.

3.5 Ballast shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 18, Non-Consumer (Class A) for EMI/RFI (conducted and radiated).

3.6 Ballast shall comply with UL Type CC rating.

Section IV - Other

4.1 Ballast shall be manufactured in a factory certified to ISO 9002 Quality System Standards.

4.2 Ballast shall carry a five-year warranty from date of manufacture against defects in material or workmanship, including replacement, for operation at a maximum case temperature of 70C. Ballasts with a "90C" designation in their catalog number shall also carry a three-year warranty at a maximum case temperature of 90C.

4.3 Manufacturer shall have a fifteen-year history of producing electronic ballasts for the North American market.

Revised 09/14/2009

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28W/835 Min Bipin T5 HE ALTO UNP

Product family description

High efficiency, environmentally responsible, ultra-slim lamps.

Features/Benefits

- Slim profile lamp and ballast.
- Better for the environment.
- Operates on programmed start ballasts.
- Fail-safe operation at end of life.
- Design flexibility.
- Improved optical control.
- Fixtures can be 40% smaller than T8 systems.
- Better fit in 2 x 2 and 2 x 4 grid ceilings.
- Low mercury (14W, 21W and 28W.)
- Energy efficient.
- Less material for less waste.

Applications

- Ideal for general, decorative and architectural lighting in offices, retail stores, hotels, schools and hospitals.

Notes

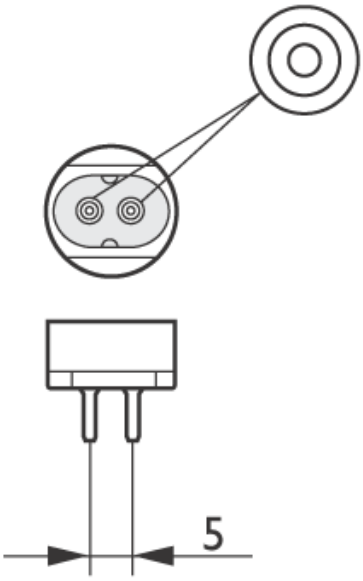
- Silhouette™ T5 nominal lamp lengths are shorter than standard sizes. See dimension chart for details.

Product data	
Product Number	230854
Full product name	28W/835 Min Bipin T5 HE ALTO UNP
Ordering Code	230854
Pack type	Unpacked
Pieces per Sku	1
Skus/Case	40
Pack UPC	046677230852
EAN2US	
Case Bar Code	50046677230857
Successor Product number	
System Description	High Efficiency
Base	Miniature Bipin
Base Information	Green [Green Base]
Bulb	T5 [16 mm]

PHILIPS

Product data	
Packing Type	UNP [Unpacked]
Packing Configuration	40
Rated Avg. Life	24000 hr
Type	na
Feature	na [Not Applicable]
Ordering Code	F28T5/835/ALTO
Pack UPC	046677230852
Case Bar Code	50046677230857
Watts	28W
Dimmable	Yes
Color Code	835 [CCT of 3500K]
Color Rendering Index	82 Ra8
Color Designation	White
Color Description	835 White
Color Temperature	3500 K
Initial Lumens	2900 Lm
Overall Length C	1163.2 mm
Diameter D	17 mm
Special packing	ALTO
Product Number	230854

TL5 HE



Base Miniature Bipin

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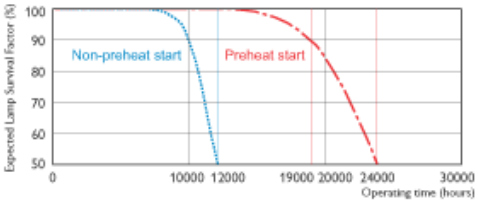
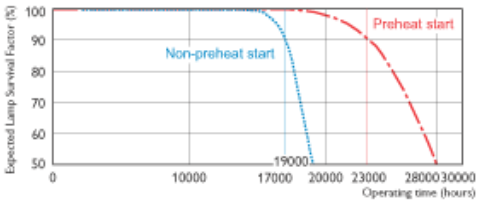


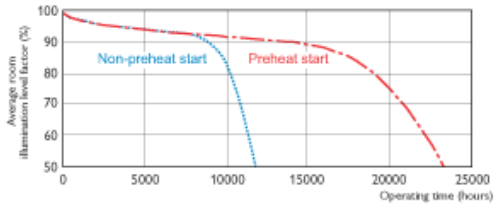
Life Expectancy 3h cycle

TL5 HE



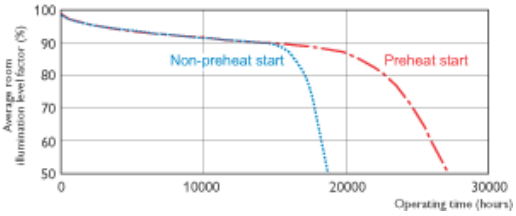
Life Expectancy 12h cycle

TL5 HE



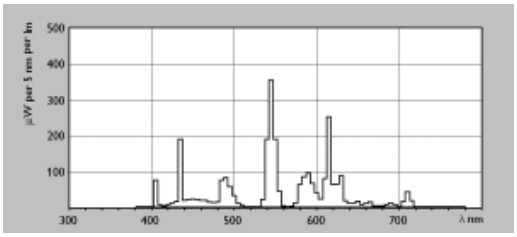
Service Life 3h cycle

TL5 HE



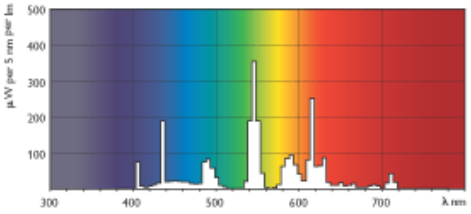
Service Life 12h cycle

TL5 HE



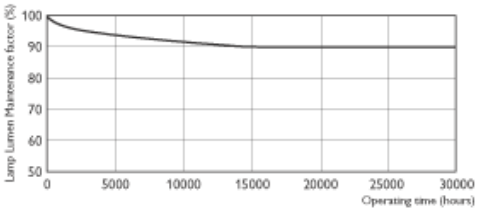
Lightcolor /835

TL5 HE/835



Lightcolor /835

TL5 HE/835



TL5 HE

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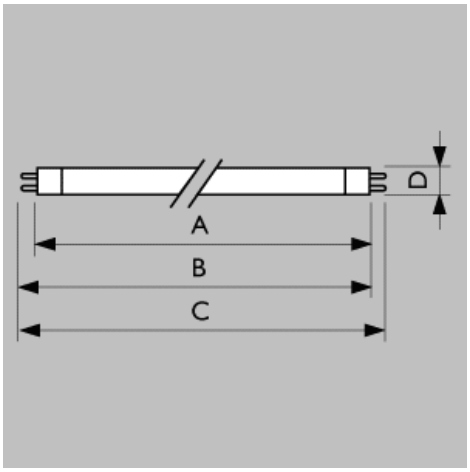
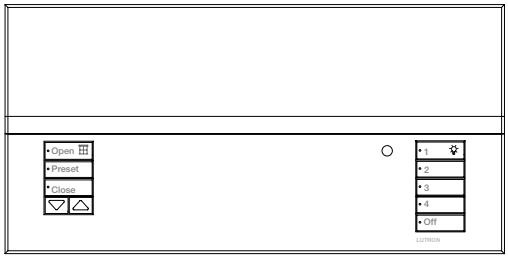


TL5 HE

	A	B	B	C	D
Full product name	Max	Min	Max	Max	Max
28W/ 835 Min Bipin T5 HE ALTO UNP	1149.0	1153.7	1156.1	1163.2	17

Appendix C | Lighting Control Specifications

GRAFIK Eye® QS Wireless Control Unit with EcoSystem®



Description

GRAFIK Eye QS Wireless with *EcoSystem* is the premier energy-saving lighting and shade control. *GRAFIK Eye* QS features an astronomic timeclock and intuitive lighting presets, which are seamlessly integrated with *EcoSystem* fluorescent ballasts and LED drivers, and Lutron's QS components and systems. Now with wireless technology and an integral *EcoSystem* bus supply, you can use the *GRAFIK Eye* QS Wireless with *EcoSystem* to control ballasts and shades without interfaces, and integrate with a variety of Lutron wireless products and systems, including Radio Powr Savr™ occupancy, vacancy, and daylight sensors, Sivoia® QS wireless shades, Pico™ wireless control, and other *GRAFIK Eye* QS wireless control units. Additionally, the *GRAFIK Eye* QS wireless is compatible with all Lutron wired QS products and systems.

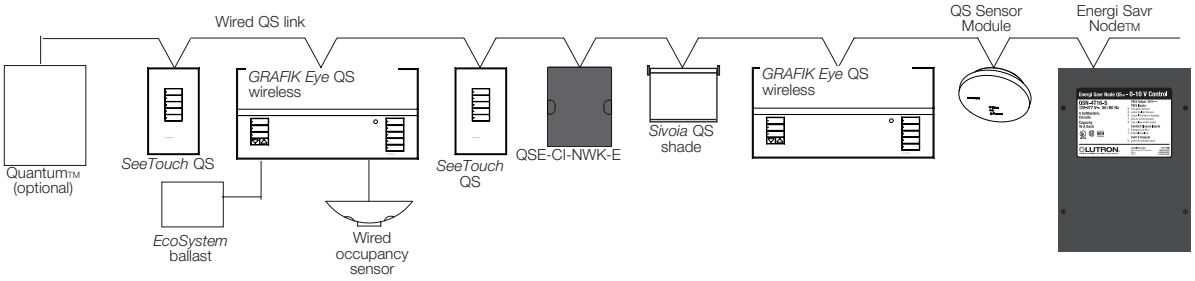
GRAFIK Eye QS Wireless with *EcoSystem* is compatible with Quantum™.

Job Name:	Model Numbers:	
Job Number:		

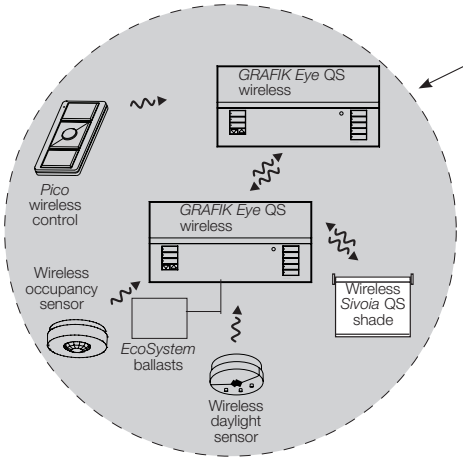
System Topologies

The *GRAFIK Eye* QS Wireless with *EcoSystem* can be specified in three different system topologies. Examples of each are shown below.

Example of Wired System

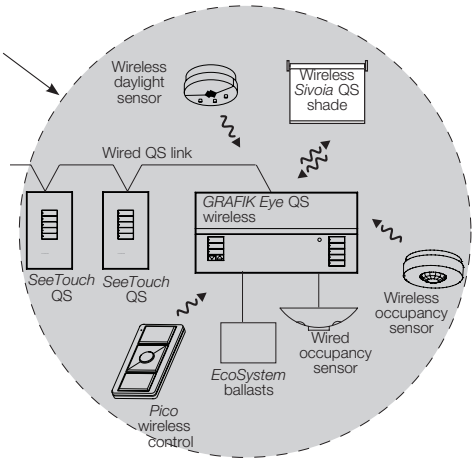


Example of *GRAFIK Eye*-centric Wireless System



30-foot (10 m) wireless range; 60 feet in open air

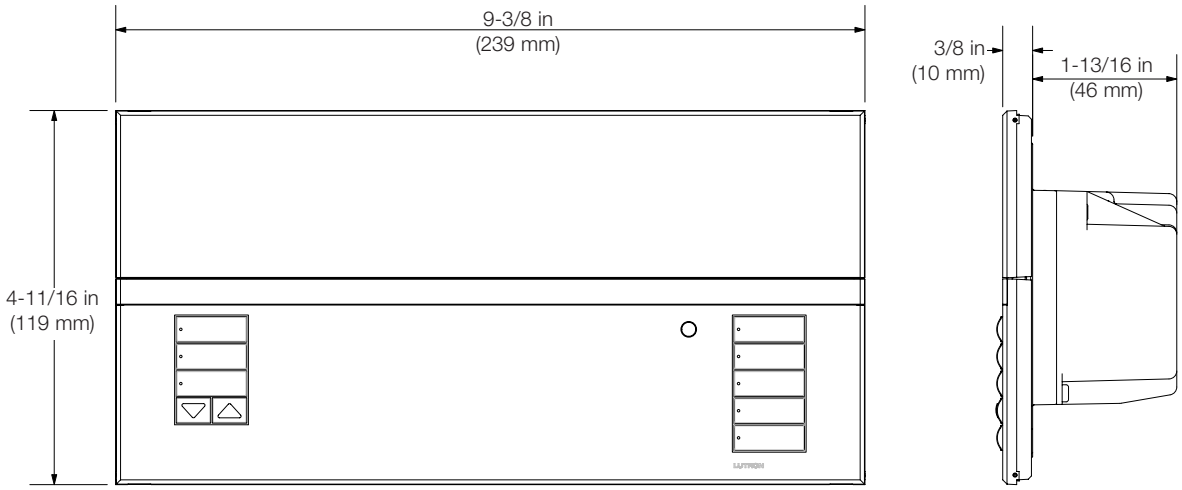
Example of Mixed Wired/*GRAFIK Eye*-centric Wireless System



Application Suggestions and Differences between *GRAFIK Eye* QS with *EcoSystem* and Standard *EcoSystem* Bus Supply

	GRAFIK Eye QS with *EcoSystem*	*EcoSystem* Bus Supply
Suggested/Recommended Applications	**Single rooms, partitioned spaces, e.g., conference room, classroom, ballroom, lobby**	**Open spaces, multiple enclosed rooms, e.g., open office, window offices**
Programming Method	Info Screen on the QS control unit	Via PDA or *EcoSystem* keypads
Timeclock	Yes (integral)	No
Compatible with SeeTouch® QS Keypads	Yes	No
Compatible with *EcoSystem* Wall Controls	No	Yes
Compatible with *EcoSystem* IR Sensors	No	Yes
Programming from *EcoSystem* PDA	No	Yes
Programming from *EcoSystem* Wall Control	No	Yes
Includes dry contact closure for integration to BMS or Security Systems	Yes	Yes (2)
Input Voltage	120-127 or 220-240 V~ 50/60 Hz	120/240/277 V~ 50/60 Hz
Number of *EcoSystem* Busses	1	1 or 2
Number of Zones	6, 8, or 16	--
Number of Line-Voltage Outputs	3 (Zones 1-3 only)	--
Compatible with other QS Devices	Yes	No

Mechanical Dimensions

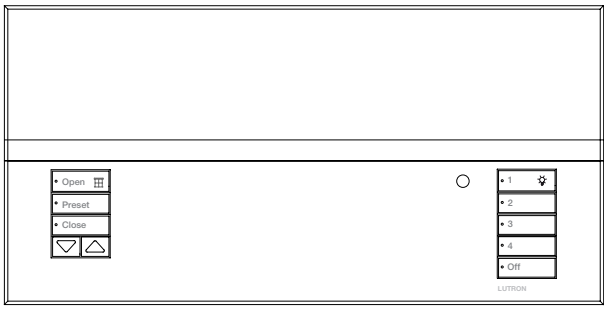


Front View Side View

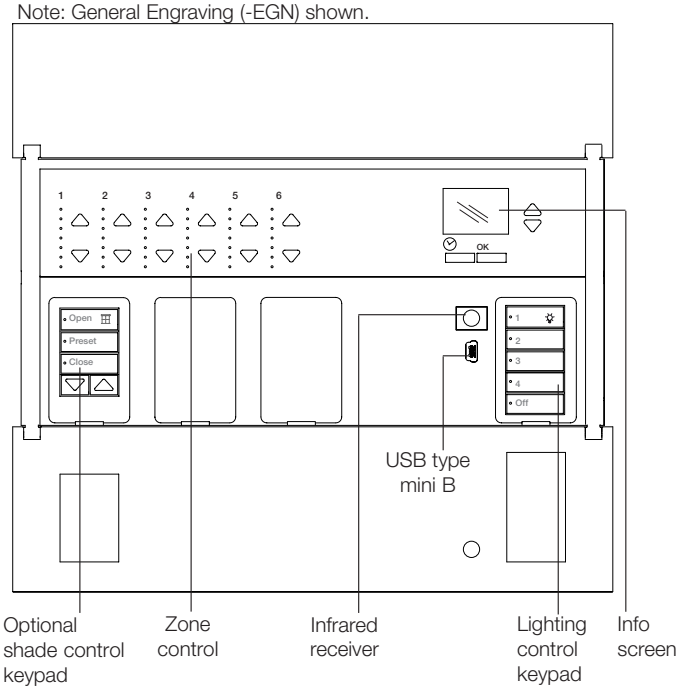
Fits into a 4-gang U.S. backbox, 3.5 in (89 mm) deep; Lutron P/N 241-400

LUTRON® SPECIFICATION SUBMITTAL Page 3

Job Name:	Model Numbers:	
Job Number:		



Note: General Engraving (-EGN) shown.



Features

- Lutron's proprietary Clear Connect™ RF technology. Operates in the 434 MHz band.
- Pushbutton recall of four preset lighting scenes, plus Off.
- Twelve (12) additional scenes accessible through other QS devices, such as seeTouch® QS wallstations.
- Zones 1, 2, and 3 can control many light source types directly and others using power modules.
- Optional integrated shade control buttons, which can also be added to the unit after installation.
- Master override buttons to raise and lower all lights.
- Allows setup of lighting scenes and shade presets using buttons on the control unit.
- Built-in infrared (IR) receiver.
- External IR connection.
- Built-in astronomic timeclock.
- Info screen shows zone light level percentage, energy savings, zone labeling, programming, and *EcoSystem* setup.
- Lockout option prevents accidental changes.
- One occupancy sensor input and 24 V⎓ power for occupancy sensor.
- QS communication link for seamless integration of lights, motorized window treatments, occupancy sensors, wallstations, and integration interfaces.
- Compatible with all Lutron QS system components.
- Wireless communication for seamless integration with a variety of Lutron wireless products and systems, including Radio Powr Savr™ occupancy, vacancy, and daylight sensors, Sivoia® QS wireless shades, Pico™ wireless controls, and other *GRAFIK Eye* QS Wireless control units.
- Control up to 6, 8, or 16 *EcoSystem* zones from internal bus supply.
- Zones 1, 2, and 3 are integral line voltage dimming zones and can be optionally programmed as *EcoSystem* zones.
- Up to 64 *EcoSystem* or HiLume® 3D ballasts can be addressed and grouped to zones.
- Integral *EcoSystem* setup and programming replaces the need for a handheld programmer (C-PDA-CLR does not communicate with *GRAFIK Eye* QS with *EcoSystem*)
- Backlit buttons with engraving make unit easy to locate and operate.
- Available in a variety of colors and finishes.

LUTRON® SPECIFICATION SUBMITTAL Page 4

Job Name:	Model Numbers:	
Job Number:		

Specifications

Input Power

- 120 - 127 V~ 50/60 Hz
- 220 - 240 V~ 50/60 Hz

Listings (120 - 127 V~)

- UL.
- CSA.
- NOM.
- CEC (Title 24).
- FCC Part 15 Class B.
- IC RSS-210.
- SCT.

Environment

- 32-104 °F (0-40 °C).
- Relative humidity less than 90% non-condensing.

Lighting Sources/Load Types

- *EcoSystem* and Hi-lume® 3D ballasts, and Hi-lume® LED drivers (available on all zones).

Zones 1, 2, and 3 can control the following lighting sources with a smooth, continuous square law dimming curve or on a full conduction non-dim basis:

- Incandescent.
- Halogen.
- Magnetic low-voltage transformer.
- Lutron Tu-Wire® electronic fluorescent dimming ballast.
- Advance Mark X® electronic dimming ballast.
- Neon and cold cathode.
- Non-dim (incandescent, magnetic low-voltage, *Tu-Wire*, or neon/cold cathode).
  Note: For higher wattage applications, or for 277 V~ applications, use Lutron power module PHPM-PA, PHPM-WBX, PHPM-PA-DV, or PHPM-WBX-DV.

Zones 1, 2, and 3 can control the following lighting sources with a smooth, continuous square law dimming curve or on a full conduction non-dim basis through separate Lutron power modules:

- Electronic low-voltage transformer.
- Lutron Hi-Lume®, Eco-10™, and Compact SE electronic fluorescent dimming ballast.
- Non-dim.
- 0 - 10 V.

Key Design Features

- RF meets FCC Part 15 Class B.
- Lightning strike protection meets ANSI/IEEE standard 62.41-1980. Can withstand voltage surges of up to 6000 V~ and current surges of up to 3000 A.
- Tested to withstand 16 kV electrostatic discharge without damage or memory loss.
- RTISS™-equipped: Compensates in real time for incoming line voltage variations (no visible flicker with +/-2% change in RMS voltage per cycle, and +/-2% Hz change in frequency per second).
- Power failure memory automatically restores lighting to the scene selected prior to power interruption, and stores timeclock and scene programming.
- Faceplate is hinged at the top and bottom, and stays open at 180° for ease of access.
- Direct control of 120 V~ and 277 V~ *EcoSystem,* Hi-lume® 3D, and Hi-lume® LED ballasts (no interface required).

Scene and Shade Buttons

- Large, rounded buttons are easy to use.
- Backlit buttons with optional engraving make it easy to find and to operate the control unit in low light conditions (backlight can be disabled).
- Optional button engraving is angled up to the eye for easy reading.
- Predefined label stickers are included for field labeling.

Preset Light and Shade Control

- 4 preset lighting scenes, plus Off, are accessible from the front of the control unit.
- 12 additional scenes are stored in the control unit and are accessible from SeeTouch® QS wallstations and QS interfaces.
- Light levels fade smoothly between scenes. Fade time can be set differently for each scene: 0 to 59 seconds, or 1 to 60 minutes. Maximum fade time from Off is 3 seconds.
- Up to 3 columns of shade control.
- Open, preset, close, and raise/lower shade buttons. Each shade column can be programmed to operate one shade or a group of shades.

Specifications

Zone Control

- Each zone has a dedicated raise and lower button to adjust the zone.
- Each zone has a dedicated 7 LED bar graph for level status. Percentage of light level and energy saved is displayed on the info screen.
- All zone information has blue backlit LEDs. Backlight turns off when idle for 30 seconds.

Info Screen

- OLED (organic LED) screen is viewable from all angles.
- Screen turns off when idle for 30 seconds.
- Programmable zone labels.
- Programmable scene labels.
- Status of real-time zone percentage and energy savings.
- Programmable timeclock schedules.
- Programmable shade labels.

Astronomic Timeclock

- Integral to all units.
- 7 daily schedules available.
- One available holiday schedule is programmable by date up to one year in advance.
- 25 events per day maximum.
- Astronomic times are programmable by integral city database or by entering latitude and longitude. Times automatically adjust throughout the year based on location.
- Automatically adjusts for Daylight Saving Time (DST), adjusted for the new dates; DST is programmable.
- Afterhours feature allows occupants to temporarily override timeclock events.

System Communications and Capacities

- Low-voltage type PELV (Class 2: USA) wiring connects control units, wallstations, motorized shades, and control interfaces.
- A QS system can have up to 100 devices and 100 zones (see System Limits table).
- A QS system can have up to 30 wireless devices.
- Class 1/Class 2 wiring connects ballast to control unit.

Infrared

- Infrared (IR) receiver allows infrared transmitters to select 8 scenes, raise/lower lighting zones, or raise/lower shades.
- Transmitter buttons imitate buttons on faceplate.
- 50 ft (15 m) line of sight range.
- Terminal block infrared input for connection.
- IR can be disabled via programming. to a wired IR input from third-party equipment.
- Works with Lutron GRX-IT and GRX-8IT infrared remote controls.

Accessory Controls: SeeTouch® QS Wallstations (QSWS2)

- Each *GRAFIK Eye* QS can power up to 3 wired *SeeTouch* QS controls.
- Wired *SeeTouch* QS keypads provide the following features:
  - Access to one or more of the 16 scenes on the *GRAFIK Eye* QS Wireless
  - Zone toggle, partitioning, sequencing, fine tune, panic mode, and timeclock enable/disable
  - Contact closure inputs
  - Various other functions that are available on specific wallstation configurations. Refer to the *SeeTouch* specification submittal.

Accessory Controls: Pico® Wireless Control (QSR4P or MRF2 models)

- The *Pico* Wireless Control is battery powered. It can control *GRAFIK Eye* QS wireless control units within a 30-foot range. It provides the following features:
  - Control of one or more zones on the *GRAFIK Eye* QS Wireless: turns zone(s) on or off, raises/lowers zone(s), and goes to user-programmable preset level
  - Scene control: the *Pico* can access scene 1, scene 16, and Off on the *GRAFIK Eye* QS, and can raise and lower lighting levels

Other Compatible QS Devices

- *Energi Savr Node*
- QS Sensor Module
- QSE-IO
- QSE-CI-DMX
- QSE-CI-NWK-E

Wireless RF Compatibility

- Lutron's proprietary Clear Connect™ RF Technology
- Operates in the 434 MHz band
- Compatible with other Lutron wireless products/systems, such as:
  - *Pico* (P/N QSR4P or MRF2)
  - *Radio Powr Savr* occupancy/vacancy/daylight sensors (P/N LRF2-)
  - *Sivoia* QS wireless products
  - Other *GRAFIK Eye* QS wireless units (P/N QSGRJ-)

Job Name:	Model Numbers:	
Job Number:		

Specifications

Occupancy Sensor(s)

- The *GRAFIK Eye* QS works with occupancy sensors through either:
  - Scene Control: Up to four sensors activate user-selectable occupancy and vacancy scenes.
  - Zone Control: up to four sensors per zone activate user-selected occupancy and vacancy zone levels.
- Occupancy sensors may include:
  - Contact closure sensors wired to CCI input on back of *GRAFIK Eye* QS
  - Wireless Radio Powr Savr™ occupancy or vacancy sensors (model numbers starting with LRF2)
  - Wired or wireless sensors connected to a QS Sensor Module (QSM)
- If any sensor in a group detects occupancy, then the *GRAFIK Eye* QS will go to the designated occupancy scene or zone level.
- If all sensors in a group detect vacancy, then the *GRAFIK Eye* QS will go to the designated vacancy scene or zone level.

Contact Closure Input (CCI) with Power Supply Output

- Each *GRAFIK Eye* QS has one contact closure input (Terminal A).
  - The attached device must provide a dry contact closure or solid-state output.
  - Input is miswire-protected up to 36 V⎓.
- Each *GRAFIK Eye* QS can supply 50 mA maximum at 24 V⎓.
  - Useful for powering occupancy sensors.
  - An auxiliary power supply must be used if the device requires more than 50 mA.
- The CCI is capable of operating in the following modes
  - Occupancy: If an occupancy sensor is wired directly to the *GRAFIK Eye* QS.
  - Emergency: This setting allows the *GRAFIK Eye* QS to work with a LUT-ELI. When an emergency situation is detected, all lights will go to full on, and no operations will be allowed until the emergency signal is cleared.
  - Afterhours: Allows the CCI to start and end the afterhours mode.
  - Timeclock: Allows the CCI to enable and disable the timeclock.
  - Scene Lockout: Prevents the user from making any changes to the control unit. The current scene will stay on until the CCI enables normal operation.
  - Save Never: Prevents any changes from being saved while the CCI is being used.
  - Disable CCI: The CCI will have no effect on the system and will not appear on the list of available sensors.

Daylight Sensor(s)

- The *GRAFIK Eye* QS with *EcoSystem* works with compatible daylight sensors to adjust electric light levels based on measured daylight levels. Sensors can be configured to control either *GRAFIK Eye* QS zones or groups of *EcoSystem* loads independent of zoning.
- Daylight sensors may include:
  - Wireless *Radio Powr Savr* (model numbers starting with LRF2)
  - Wired sensors connected to *EcoSystem* ballasts or interfaces
  - Wired or wireless sensors connected to a QS sensor module (QSM)
- In Zone Mode, a daylight sensor can control one or more *GRAFIK Eye* QS zones. Each zone can be calibrated to target light levels.
  - A zone can be controlled by no more than one daylight sensor
- In Group Mode, a daylight sensor can control one or more *EcoSystem* loads, regardless of how they are zoned on the *GRAFIK Eye* QS.
  - A group can be controlled by a single daylight sensor
  - Each group can be calibrated to independent target light levels
  - Up to 16 groups are available
- Daylight control can be enabled or disabled on a scene-by-scene basis
  - By default, daylight control is enabled in all scenes

Note: Daylight control through the *GRAFIK Eye* QS only affects lighting loads. Shade groups cannot be controlled by daylight sensors.

LUTRON® SPECIFICATION SUBMITTAL Page 7

Job Name:	Model Numbers:	
Job Number:		

Capacities

	220 - 240 V~ 50 / 60 Hz	120 - 127 V~ 50 / 60 Hz
Unit Capacity (watts)	3000	2000
MLV	3000 VA / 2400 W	2000 VA / 1600 W
Zone Capacity (watts)	40 – 1200	25 – 800
MLV	40 – 1200 VA / 40 – 960 W	25 – 800 VA / 25 – 600 W

Load Type Notes (Zones 1, 2 and 3)

- All electronic low-voltage (ELV) lighting used with an interface must be rated for reverse phase control dimming. Before installing an ELV light source, verify with the manufacturer that their transformer can be dimmed. When dimming, an ELV interface (such as the PHPM-PA-DV-WH) must be used with the control unit.
- Not all zones must be connected; however, connected zones must have a minimum load as specified above.
- Maximum total lighting load for a magnetic low-voltage (MLV) varies by input voltage:
  - 120 - 127 V~: 800 VA / 600 W
  - 220 - 240 V~: 1200 VA / 960 W
- No zone may be loaded with more than the capacity specified above.

System Limits

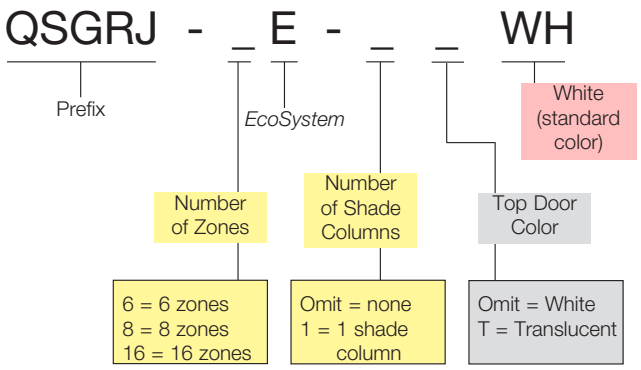
- The QS wired communication link is limited to 100 devices or 100 zones. Please note the zone count and power draw unit information in the following table.

	QS Device	Zone Count	Power Draw Units (supplied)	Power Draw Units (consumed)
	3-zone *GRAFIK Eye* QS	3	3	0
	4-zone *GRAFIK Eye* QS	4	3	0
	6-zone *GRAFIK Eye* QS	6	3	0
	8-zone*GRAFIK Eye* QS	8	3	0
	16-zone *GRAFIK Eye* QS	16	3	0
	*seeTouch* QS	0	0	1
	International *seeTouch* QS	0	0	1
	*Sivoia* QS	1	0	(Refer to Spec. Submittal)
	Contact closure interface	2	0	3
	Network interface	0	0	2
	DMX interface	0	0	2
	QS smart power panel	0	(Refer to Spec. Submittal)	0
	QS link power supply	0	8	0

Job Name:	Model Numbers:	
Job Number:		

GRAFIK Eye® QS Wireless with EcoSystem®
Standard Model Numbers

See following pages for Ordering Custom (Non-Standard) Model Numbers
See Standard Color Combinations page for faceplate, stripe, and button colors



Example:
QSGRJ-6E-1TWH
6-zone standard white unit with 1 shade column and translucent top door.

Unit will ship unengraved with engraving certificate that customer can redeem at no charge.

Available Standard Model Numbers

6 Zones	8 Zones	16 Zones
QSGRJ-6E-WH	QSGRJ-8E-WH	QSGRJ-16E-WH
QSGRJ-6E-TWH	QSGRJ-8E-TWH	QSGRJ-16E-TWH
QSGRJ-6E-1WH	QSGRJ-8E-1WH	QSGRJ-16E-1WH
QSGRJ-6E-1TWH	QSGRJ-8E-1TWH	QSGRJ-16E-1TWH

Important Note:

For any non-standard units, you must order **BOTH** a base unit and a Faceplate Kit. Please see the Custom Ordering Information on the following pages.

GRAFIK Eye® QS Wireless with EcoSystem®
Custom Color Options and Model Numbers
You must order a Base Unit and a Faceplate Kit
See Standard Color Combinations page for faceplate, stripe, and button colors

Base Unit

QSGRJ - _ E

- QSGRJ: Prefix
- _: Number of Zones
  - 6 = 6 zones
  - 8 = 8 zones
  - 16 = 16 zones
- E: *EcoSystem*

Example:

QSGRJ-6E
6-zone base unit
and
QSGFP-2IV-EGN
Ivory faceplate kit with two shade columns and general engraving

Faceplate Kit
(includes coordinating stripe and buttons)

QSGFP - - -

- QSGFP: Faceplate Prefix
- Number of Shade Columns
  - Omit = none
  - 1 = 1 column
  - 2 = 2 columns
  - 3 = 3 columns
- Top Door Color
  - Omit = same as unit
  - T = Translucent
- Color/Finish
- Keypad Engraving Code

Faceplate Custom Color/Finish Codes

Architectural Matte Finishes	
Standard (ship in 48 hours)	
White	WH
Ivory	IV
Beige	BE
Gray	GR
Brown	BR
Black	BL
Almond	AL
Light Almond	LA

Architectural Metal Finishes	
Bright Brass	BB
Bright Chrome	BC
Bright Nickel	BN
Satin Brass	SB
Satin Chrome	SC
Satin Nickel	SN
Antique Brass	QB
Antique Bronze	QZ

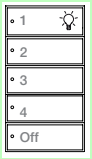
Anodized Aluminum Finishes	
Clear	CLA
Black	BLA
Brass	BRA

Satin Color Matte Finishes	
Snow	SW
Biscuit	BI
Eggshell	ES
Taupe	TP
Midnight	MN
Limestone	LS
Stone	ST
Desert Stone	DS
Terracotta	TC
Hot	HT
Goldstone	GS
Palladium	PD
Plum	PL
Turquoise	TQ
Bluestone	BG
Sea Glass	SG
Greenbrier	GB
Sienna	SI
Merlot	MR
Mocha Stone	MS

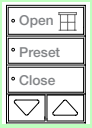
Keypad Engraving Codes

Omit = Unengraved
Ships with engraving certificate that customer can redeem at no charge

EGN = General Engraving



Lighting keypad



Shade column

NST = Non-Standard Text Engraving
Please visit the *GRAFIK Eye* QS website at **www.lutron.com/grafikeyeqs** for custom engraving forms. Submit completed form with order, and unit will ship engraved as specified by customer.

Job Name:	Model Numbers:	
Job Number:		

GRAFIK Eye® QS Wireless with EcoSystem®
Custom Options and Model Numbers
See previous pages for Standard and Other Custom Model Numbers
See Standard Color Combinations page for faceplate, stripe, and button colors

Custom Button Kit

QSGB - 5B - WH -

- QSGB: Custom Button Kit Prefix
- 5B: Button Configuration
- WH: Button Color/Finish
- Keypad Engraving Code

Button Configuration:
- 3BRL = 3-button with raise/lower (shade column)
- 5B = 5-button (lighting keypad)

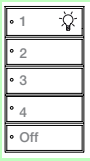
Button Kit Custom Color/Finish Codes

Architectural Matte Finishes		Satin Color Matte Finishes	
White	WH	Snow	SW
Ivory	IV	Biscuit	BI
Beige	BE	Eggshell	ES
Gray	GR	Taupe	TP
Brown	BR		
Black	BL		
Almond	AL		
Light Almond	LA		

Keypad Engraving Codes

Omit = Unengraved
Ships with engraving certificate that customer can redeem at no charge

EGN = General Engraving



Lighting keypad

Shade column

NST = Non-Standard Text Engraving
Please visit the *GRAFIK Eye* QS website at **www.lutron.com/grafikeyeqs** for custom engraving forms. Submit completed form with order, and unit will ship engraved as specified by customer.

Custom Stripe Kit

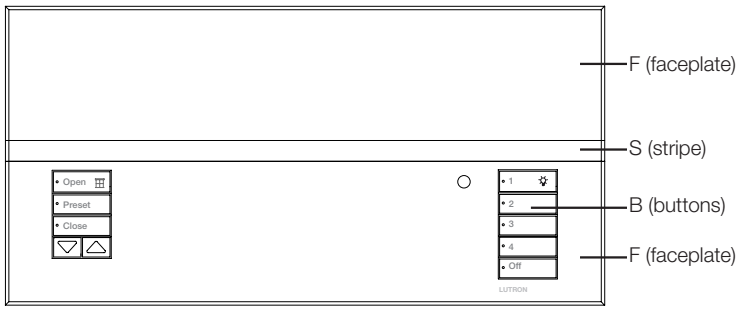
QSGS - WH

- QSGS: Stripe Kit Prefix
- WH: Stripe Color/Finish

Stripe Custom Color/Finish Codes
Same as Faceplate colors on previous page

Job Name:	Model Numbers:	
Job Number:		

GRAFIK Eye® QS Wireless with EcoSystem®
Standard Color Combinations
See previous pages for Standard and Custom Model Numbers



Faceplate is comprised of a top and bottom. The bottom will always be the color indicated under "faceplate." The top may be the same color or translucent. Use the chart for faceplates that have the same color top and bottom. If a translucent lid is chosen, the stripe will automatically be the same color as the bottom lid.

Example:
If you order QSGRJ-6E-1WH, your *GRAFIK Eye* QS with 6 lighting zones and 1 shade column will come with a white faceplate (both top and bottom), gray stripe, and white buttons.

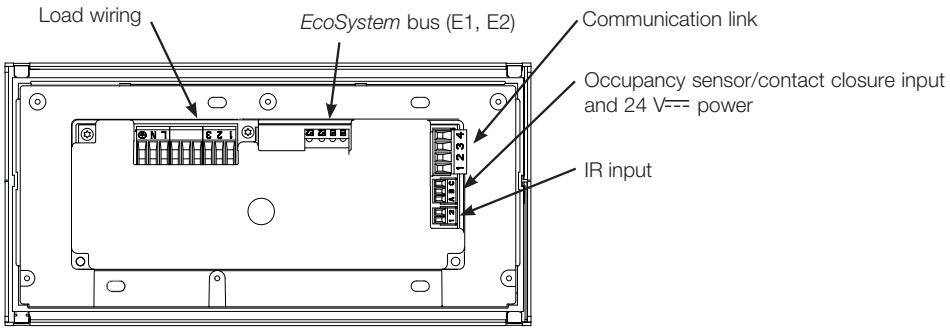
Suffix	Faceplate (F)	Stripe (S)	Button (B)
Architectural Matte			
WH	White	Gray	White
IV	Ivory	Beige	Ivory
BE	Beige	Ivory	Beige
GR	Gray	Black	Gray
BR	Brown	Black	Brown
BL	Black	Gray	Black
AL	Almond	Light Almond	Almond
LA	Light Almond	Almond	Light Almond
Architectural Metal			
BB	Bright Brass	Black	Black
BC	Bright Chrome	Black	Black
BN	Bright Nickel	Black	Black
SB	Satin Brass	Black	Black
SC	Satin Chrome	Black	Black
SN	Satin Nickel	Black	Black
QB	Antique Brass	Black	Black
QZ	Antique Bronze	Black	Black
Anodized			
CLA	Clear	Black	Black
BLA	Black	Black	Black
BRA	Brass	Black	Black

Suffix	Faceplate (F)	Stripe (S)	Button (B)
Satin Matte			
MN	Midnight	Gray	Black
TP	Taupe	Gray	Taupe
SW	Snow	Gray	Snow
ES	Eggshell	Beige	Eggshell
BI	Biscuit	Eggshell	Biscuit
LS	Limestone	Gray	Gray
ST	Stone	Gray	Gray
DS	Desert Stone	Taupe	Taupe
TC	Terracotta	Taupe	Taupe
BG	Bluestone	Gray	Gray
HT	Hot	Taupe	Taupe
MR	Merlot	Taupe	Taupe
SI	Sienna	Brown	Brown
GB	Greenbrier	Gray	Gray
SG	Sea Glass	Gray	Gray
MS	Mocha Stone	Taupe	Taupe
GS	Goldstone	Ivory	Ivory
PD	Palladium	Gray	Gray
PL	Plum	Taupe	Taupe
TQ	Turquoise	Gray	Gray

Job Name:	Model Numbers:	
Job Number:		

Overview

Terminations

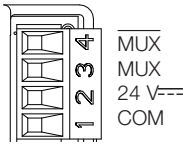


Wire Gauge	Maximum *EcoSystem* Bus Length
12 AWG (4.0 mm²)	2200 ft (671 m)
14 AWG (2.5 mm²)	1400 ft (427 m)
16 AWG (1.5 mm²)	900 ft (275 m)
18 AWG (1.0 mm²)	570 ft (175 m)

PELV (Class 2: USA) QS Link Low-Voltage Wiring

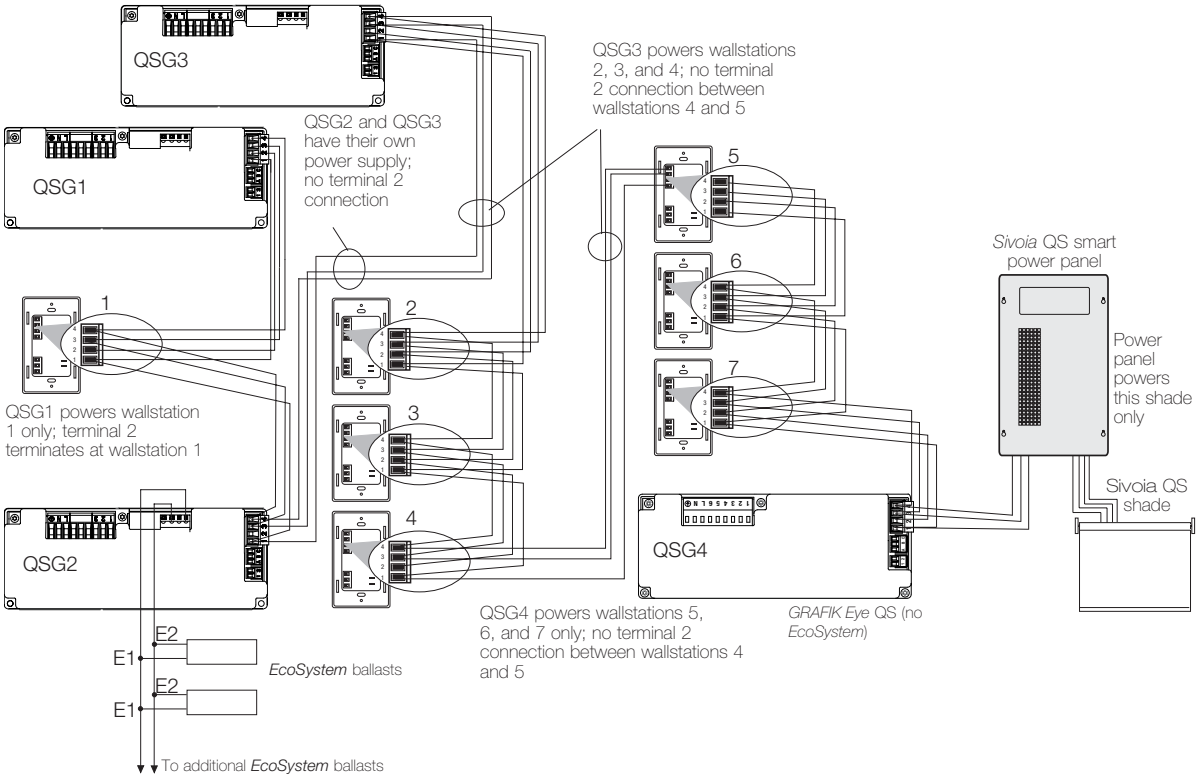
- Each PELV (Class 2: USA) terminal accepts up to two 18 AWG (1.0 mm²) wires.
- Connect the terminal 1, 3, and 4 connections to all control units, wallstations, and control interfaces.
- Each control unit has its own power supply. Terminate the terminal 2 connection (24 V⎓ power) so that each control unit supplies power to a maximum of three wallstations. Each wallstation should receive power from only one control unit.
- Total length of control link must not exceed 2000 ft (610 m).
- Do not allow PELV (Class 2: USA) wires to contact line/mains wires.

Communication Link Terminal Detail



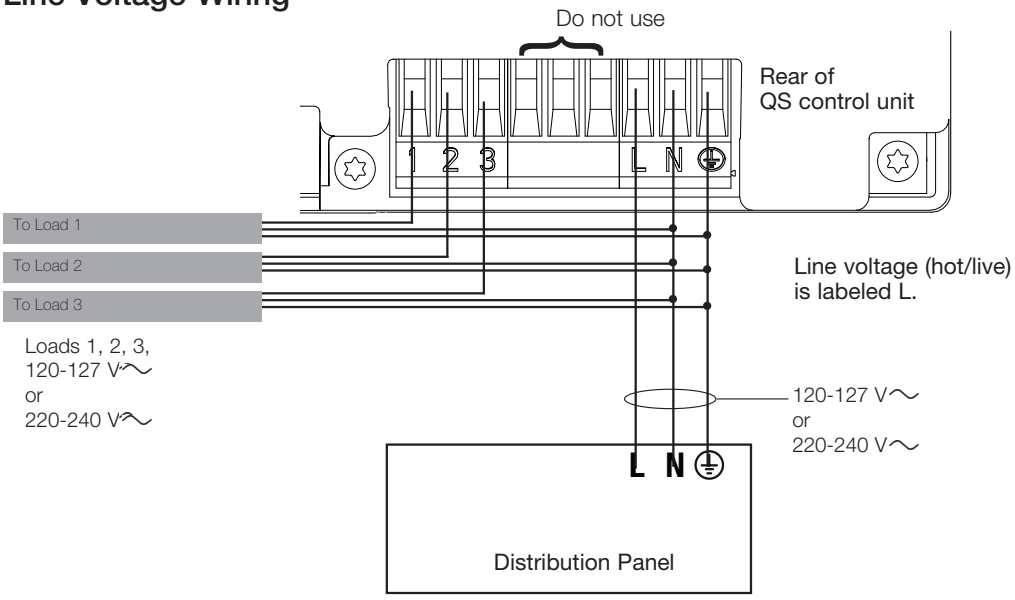
Low-Voltage Wiring Example

Control units (QSG) shown in rear view



Job Name:	Model Numbers:	
Job Number:		

Line Voltage Wiring

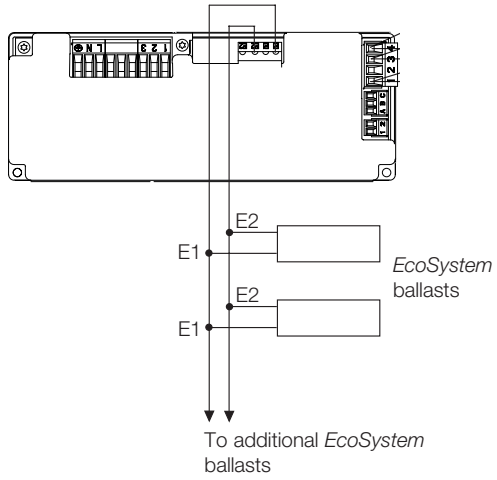


- Pull power wiring from distribution panel and to light fixtures.
- Each line voltage terminal can accept one 12 AWG (2.5 mm^2) wire.
- Consult Lutron for non-dim relay wiring and/or load side emergency transfer wiring.

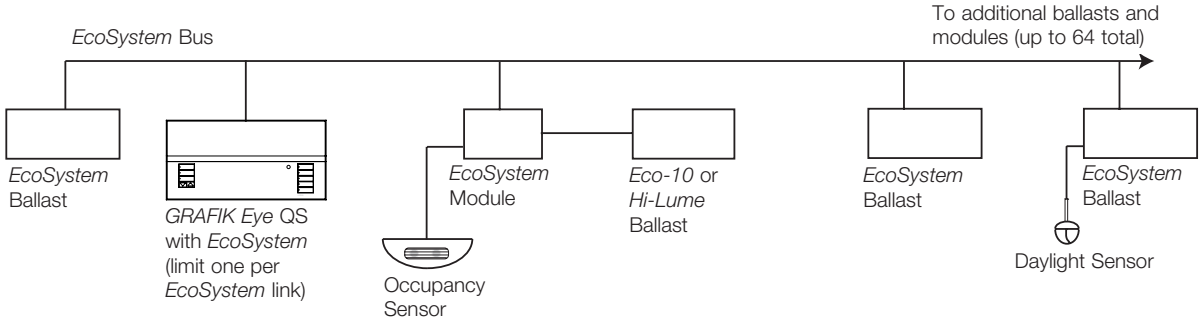
Job Name:	Model Numbers:	
Job Number:		

EcoSystem® Bus Wiring

EcoSystem Bus Link Terminal Detail



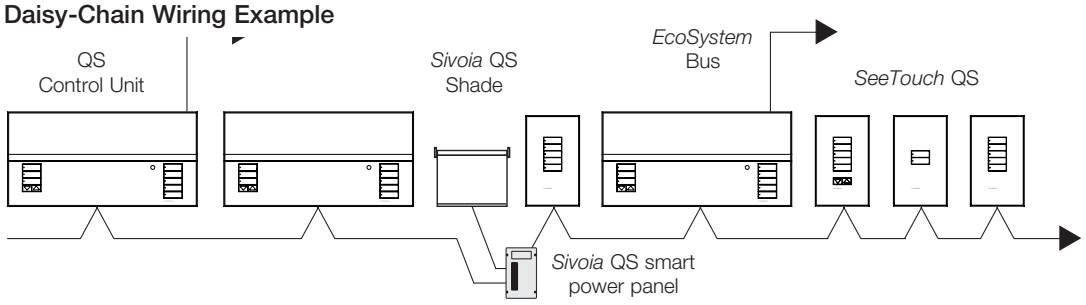
EcoSystem Bus Wiring Example



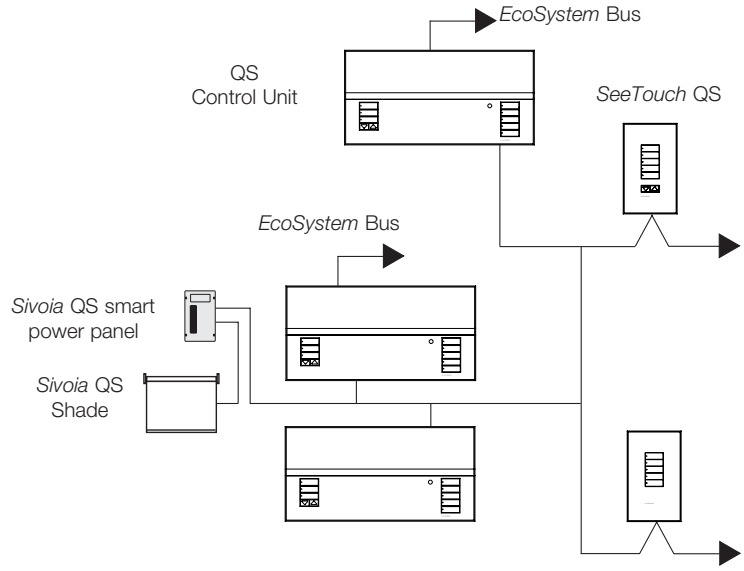
PELV (Class 2: USA) QS Link Wiring

- System communication uses low-voltage wiring.
- Wiring can be daisy-chained or T-tapped.
- Wiring must be run separately from line/mains voltage.
- PELV (Class 2: USA) wiring link requires:
  - Two 18 AWG (1.0 mm²) conductors for control power.
  - One twisted, shielded pair of 22 AWG (0.5 mm²) for data link.
  - Available from Lutron, P/N GRX-CBL-346S; check compatibility in your area.
- Total length of control link must not exceed 2000 ft (610 m).

Daisy-Chain Wiring Example

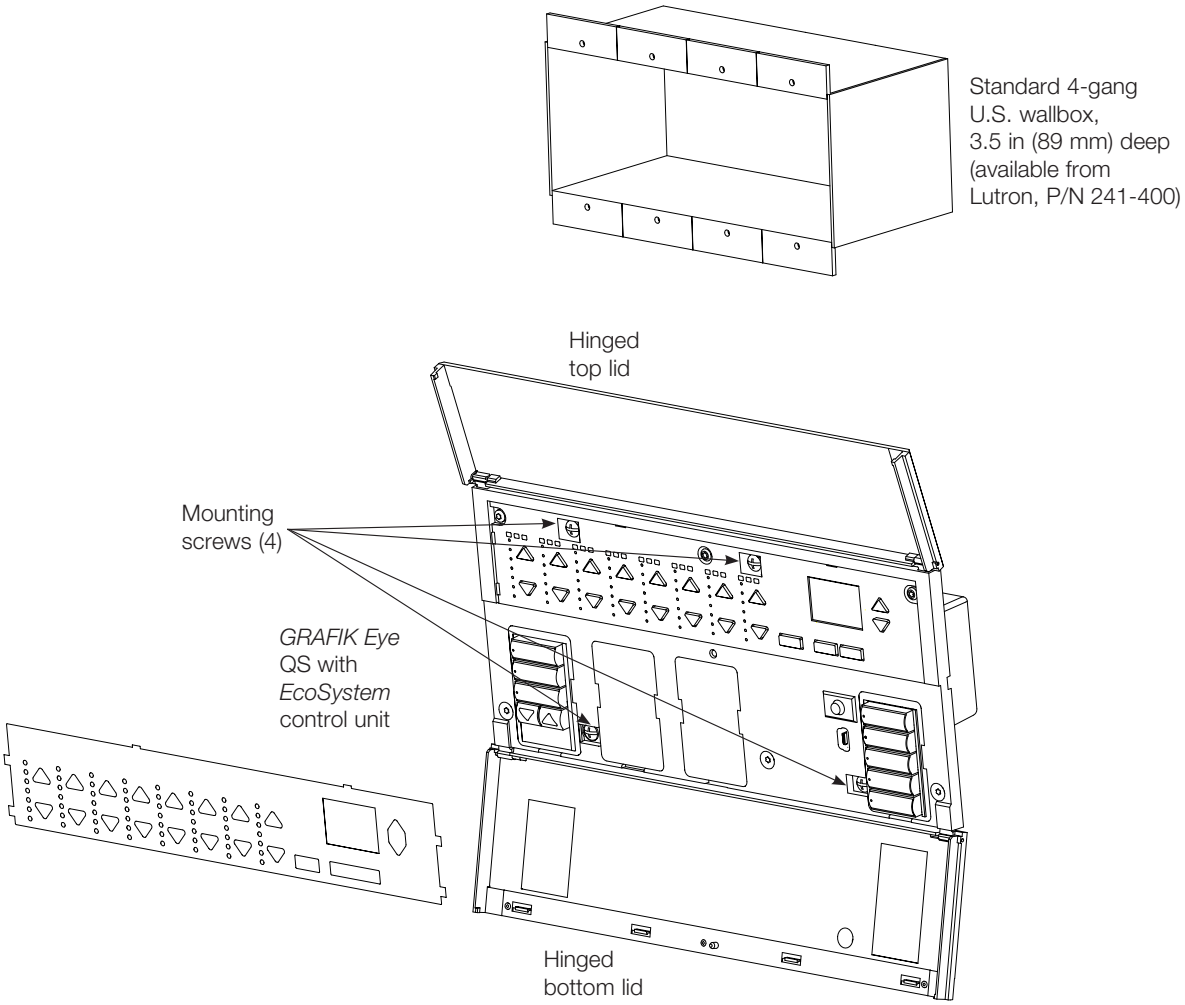


T-Tap Wiring Example



Job Name:	Model Numbers:	
Job Number:		

Mounting



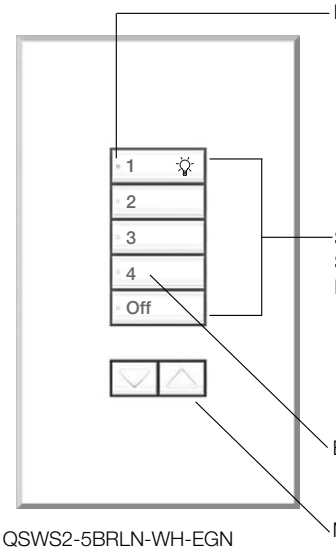
Job Name:	Model Numbers:	
Job Number:		

LUTRON® seeTouch® QS Wallstations

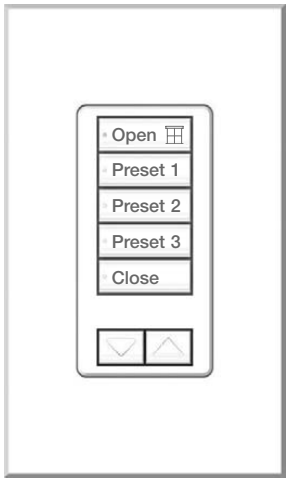
qsws2-5brl 03.11.08

Color and Engraving Codes

QSWS2-5BRLN-___-___
QSWS2-5BRLI-___-___
5-Button Wallstation with Raise/Lower



QSWS2-5BRLN-WH-EGN
(Non-insert version)



QSWS2-5BRLI-WH-E01
(Insert version)

Description

- Used to select and adjust scenes.
- Receives up to two contact closure inputs via a connector on the back of the Wallstation.
- Contact closure features:
  - When keypad is programmed as scene or zone toggle, input 1 closure will perform the top button action, and input 2 closure will perform the bottom button action.
  - When keypad is programmed as a partition control, input 1 controls the partition programmed to the top button (closure = close partition; opening = open partition) and input 2 controls the partition programmed to the bottom button (closure = close partition; opening = open partition).
- Large, rounded buttons are easy to use.
- Backlit buttons with optional engraving make it easy to find and operate the Wallstation in low light conditions.
- Optional button engraving is angled up to the eye for easy reading.
- Master raise/lower brightens or dims all lighting or raises/lowers all assigned shades in the last selected scene or toggled group.
- Options for programming buttons after installation (choose one):
  - Recalls preset light levels for scenes (1 through 4 and Off; 5 through 8 and Off; 9 through 12 and Off; or 13 through 16 and Off).
  - Each button will toggle a zone or a group of zones.
  - LEDs reflect door status of four partitions.
- Shade control features:
  - Used to control multiple groups of shades independently from a single-gang keypad (e.g., a window with a sheer shade and a blackout shade).
  - Can control Sivoia QS Window Treatments.
  - Pressing the Open (or Close) button once will cause the window treatments to move to their fully open (or closed) position. Tap any button (regardless of function) to stop a shade that is in motion.

Finish and Engraving Options

- Standard model wallstations are white and come unengraved.
- Available with button engraving that can be customized for lighting and/or shade applications on any model.
- Three engraving options are available: General Engraving (EGN), Standard Engraving (E01), and Non-Standard Text Engraving (NST). For more details, please visit the *GRAFIK Eye QS* website at **www.lutron.com/grafikeyeqs.**

LUTRON® SPECIFICATION SUBMITTAL Page 1

Job Name:	Model Numbers:	
Job Number:		

Specifications

Power Input (Control Link Terminal 2)

Low-voltage type PELV (Class 2: USA). Operating voltage: 24 V⎓

Key Design Features

- Field-changeable button and faceplate assemblies allow easy customization.
- Meets IEC 801-2. Tested to withstand 15 kV electro-static discharge without damage or memory loss.
- Faceplate snaps on with no visible means of attachment.
- Available as an "insert" style control for multi-ganging.
- Can be ganged to share a common faceplate with NovaT*® and Vareo® Dimmers. To order new Wallplates for multi-ganging, specify "R3" openings in a *NovaT** multi-gang FB (fins broken) Series model number.
- Use Faceplate Replacement Kits to change color, button configuration, or engraving.
- Faceplate Replacement Kits may also be used to convert between non-insert and insert configurations.

System Communications and Capacity

- Low-voltage type PELV (Class 2: USA) wiring connects Wallstations to other devices on the QS Link.
- A QS system can have up to 100 devices and 100 zones; *SeeTouch* QS counts as one device and no zones on the QS Link.

Terminals

Accept up to two #18 AWG (1.0 mm²) typical.

Environment

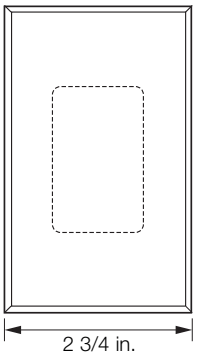
32-104 °F (0-40 °C). Relative humidity less than 90% non-condensing.

Mounting

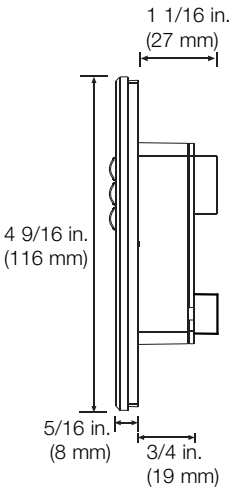
Typical backbox dimensions: 3.74 in. (95 mm) high, 2.17 in. (55 mm) wide, 2.75 in. (70 mm) deep.

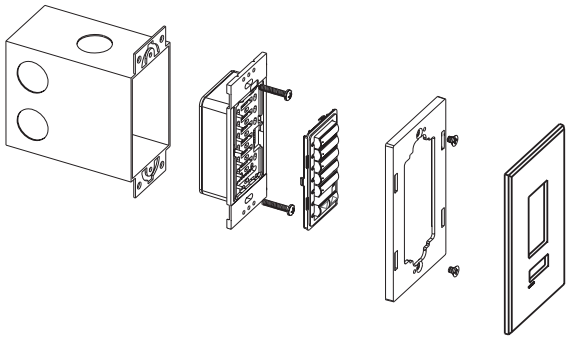
Dimensions

Front View

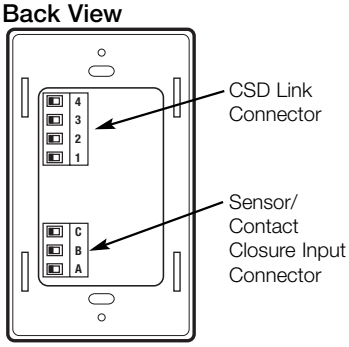


Side View





Back View



Job Name:	Model Numbers:	
Job Number:		

How to Build a Standard *seeTouch* QS Model Number

QSWS2-____ ____ -WH

- Prefix
- Button Configuration (see next page)
- Insert Style
  - N: Non-insert
  - I: Insert
- White Matte Finish

How to Build a Custom *seeTouch* QS Model Number

QSWS2-____ ____ - ____ - ____

- Prefix
- Button Configuration (see next page)
- Insert Style
  - N: Non-insert
  - I: Insert
- Color/Finish
- Engraving Code

Engraving Codes

Omit: Unengraved
EGN: General Engraving
E01: Standard Engraving
NST: Non-Standard Text Engraving
Please visit the *GRAFIK Eye* QS website at **www.lutron.com/grafikeyeqs** for custom engraving forms

Color/Finish Codes

Architectural Matte Finishes	
White	WH
Ivory	IV
Beige	BE
Gray	GR
Brown	BR
Black	BL
Almond	AL
Light Almond	LA
Taupe	TP

Architectural Metal Finishes
With black plastic buttons (standard).

Bright Brass	BB
Bright Chrome	BC
Bright Nickel	BN
Satin Brass	SB
Satin Chrome	SC
Satin Nickel	SN
Antique Brass	QB
Antique Bronze	QZ

Anodized Aluminum Finishes
With black plastic buttons (standard).

Clear	CLA
Black	BLA
Brass	BRA

Satin Color Matte Finishes™
Available with Insert (I) style controls only.

Hot	HT*
Merlot	MR*
Plum	PL*
Turquoise	TQ*
Sea glass	SG*
Biscuit	BI
Eggshell	ES
Taupe	TP
Snow	SW
Palladium	PD*
Midnight	MN
Sienna	SI*
Terracotta	TC*
Greenbriar	GB*
Bluestone	BG*
Mocha stone	MS*
Goldstone	QS*
Desert Stone	DS*
Stone	ST*
Limestone	LS*

*Note: Some *Satin Colors* units ship with different color buttons. For more information, please visit the *seeTouch* website at **www.lutron.com/seetouch**.

LUTRON® SPECIFICATION SUBMITTAL Page 3

Job Name:	Model Numbers:	
Job Number:		

How to Build a *seeTouch* QS Model Number (continued)

QSWS2-____

(see previous page for complete model number ordering information)

Prefix

Button Configuration

1B
1-button

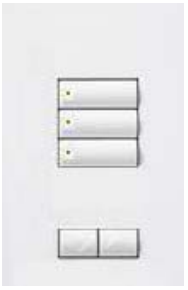
2B
2-button

3B
3-button

5B
5-button

7B
7-button

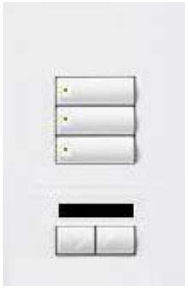
2BRL
2-button with raise/lower



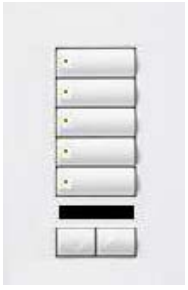
3BRL
3-button with raise/lower

5BRL
5-button with raise/lower

2BRLIR
2-button with IR receiver and raise/lower



3BRLIR
3-button with IR receiver and raise/lower



5BRLIR
5-button with IR receiver and raise/lower

1RLD
Dual with 3-button and 2-button with raise/lower

2RLD
Dual 2-button with raise/lower

3BD
Dual 3-button

LUTRON SPECIFICATION SUBMITTAL Page 4

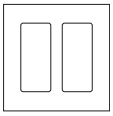
Job Name:	Model Numbers:	
Job Number:		

Faceplate Information

Multi-ganging

- Order Insert (I) style controls.
- To order Wallplates for multi-ganging, specify "R3" openings in a NovaT*® multi-gang FB (fins broken) Series model number.

Examples:



Wallplate for 2 *seeTouch* Wallstations,
Model # NT-R3-R3-FB-(color)

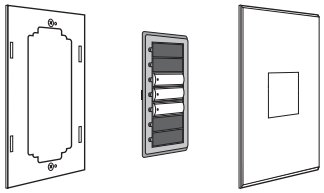
- Order Claro® Wallplates for multi-ganging Wallstations in Gloss Finishes.
- Order Satin Colors™ Wallplates for multi-ganging Wallstations in *Satin Colors*.

Note: New button inserts are not included with multi-ganging Wallplates.

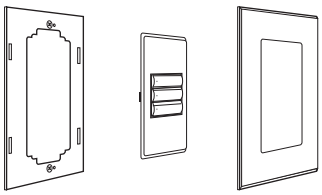
Faceplate Replacement Kits

Use Faceplate Replacement Kits to change: colors, button configuration, engraving, between insert and non-insert versions. Each Kit includes an adapter, button assembly, and wallplate

Non-Insert Kit



Insert Kit



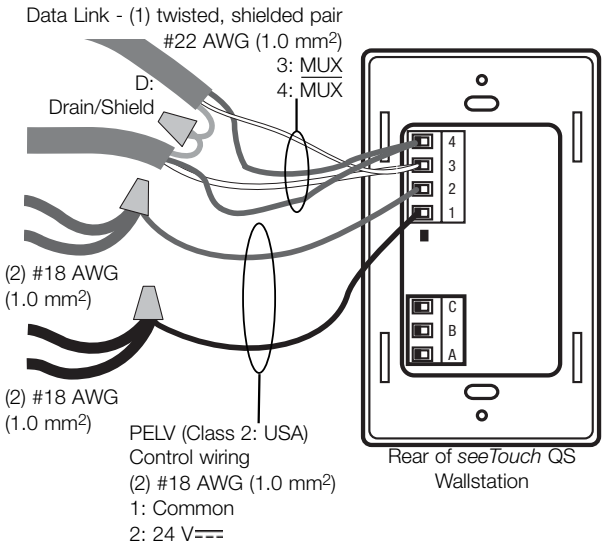
Wallstation Installation

Control Station Device (CSD) Link Wiring

- Use low-voltage PELV (Class 2: USA) wiring to connect Wallstations to the QS link.
- Make connections inside the wallbox or in a switch/junction box with a maximum wire length of 8 feet (2.5 m) from the link to the Wallstation.
- Two #18 AWG (1.0 mm²) conductors for common (terminal 1) and 24 V⎓ (terminal 2). These will not fit in terminals. Connect as shown.
- One shielded, twisted pair #22 AWG (1.0 mm²) for data link (terminals 3 and 4).
- Connect Drain/Shield as shown. Do not connect to Ground (Earth) or Wallstation. Connect the bare drain wires and cut off the outside shield.

Note: Some Wallstations have a "D" terminal for Drain. The Drain/Shield wire may be connected to this terminal.

Wiring to Control Link



Note: Use appropriate wire connecting devices as specified by local codes.

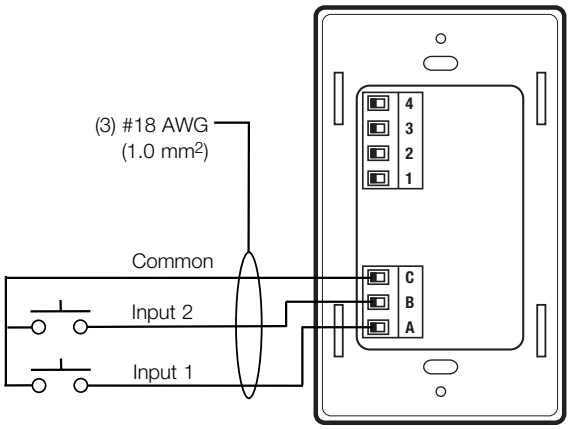
Contact Closure Inputs

Specifications

- Inputs must be dry contact closure or ground-referenced solid-state outputs:
- Wallstation is miswire protected up to 36 V⎓.
- Outputs must stay in the closed or open states for at least 40 msec in order to be recognized by the Wallstation.
- To ensure compatibility with wired occupancy sensors, only use sensors with the Relay model option – those with model numbers ending with R (LOS-CDT-xxxxR or LOS-WDT-R)

Contact Closure Input Wiring

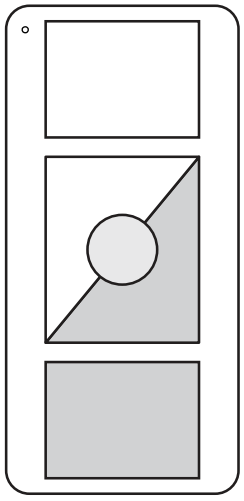
- Use low-voltage PELV (Class 2: USA) wiring to connect the contact closure inputs to the Wallstation.



Rear of *seeTouch* QS Wallstation

Pico™ Wireless Control and Tabletop Pedestal

The *Pico* Wireless Control is a flexible and easy to use device that allows the user to control Sivioia® QS wireless shades and drapes, and Radio Ra®-SR lighting devices. The *Pico* can function as a tabletop control on a pedestal, a lightweight handheld remote, or it can be wall-mounted within a Lutron Claro® faceplate, to mimic a traditional keypad. The battery operated control requires no external power or communication wiring.



Pico Wireless Control

Features

- Provides control for a *Sivoia* QS wireless shading system, *RadioRa*-SR system and GRAFIK Eye® QS wireless system, allowing users to:
  - Open and close shades or drapes, or turn lights on and off
  - Raise and lower shades, drapes, or lighting levels
  - Recall a favorite shade or drape position, or lighting level.
- Control of one or more zones on the *GRAFIK Eye* QS Wireless: turns zone(s) on or off, raises/lowers zone(s), and goes to user-programmable preset level
- Scene control: the *Pico* wireless control can access scene 1, scene 16, and OFF on the *GRAFIK Eye* QS, and can raise and lower lighting levels
- Control available in 6 colors and 8 button marking options to suit a variety of applications
- Easy reconfiguration for use as a handheld control, wall-mount control, or table top control using the optional pedestal.
- Simply install as a 1-gang or 2-gang installation with the included wall mount adapter and mounting template
- Tabletop pedestal available in both single and dual configurations in black and white
- Battery powered control (battery included)
- Can provide control to unlimited number of shades, drapes or lighting devices within a 30 ft (9 m) range.

LUTRON SPECIFICATION SUBMITTAL Page 1

Job Name:	Model Numbers:
Job Number:	

Specifications

Standards

- FCC Approved. Complies with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules

Power

- Operating Voltage 3 V⎓
- (1) CR2032 Battery (included)

Key Design Features.

- Configurable to be used a handheld remote, wall-mount control, or table top control, with the optional pedestal
- Fits inside a standard designer wallplate opening or Lutron Claro® wallplate
- Can be wall mounted in variety of configurations
  - Alone without a wallplate
  - Alone with in a 1-gang wallplate
  - With another *Pico* control in a 2-gang wallplate
  - With another designer style device in a 2 gang wallplate
- Mounting template is provided to accommodate all wall mounting configurations
- Optional pedestal is available in a single configuration for converting the *Pico* to a tabletop control. The pedestal is also available in a dual configuration for two *Pico* controls.

System Communication and Capacity

- *Pico* controls communicate with Sivoia® QS Wireless shades and drapes and Radio RA-SR components with radio frequency (RF) at 434 Mhz FM
- Thousands of system addresses prevent cross talk between systems
- *Pico* controls can be assigned to control all shades, drapes or lighting devices that are within a 30 ft (9 m) range

Environment

- Ambient operating temperature: 32 – 104˚ F (0 – 40˚ C)
- Maximum 90% non-condensing relative humidity
- Indoor use only

Warranty

- 1 year limited warranty

Job Name:	Model Numbers:
Job Number:	

Pico™ Control Model Number

QSR4P-3R-*XX*-E*XX*

Button Marking Code
Color Code

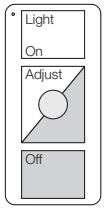
Pico Control Color Codes:
(Designer Gloss)

Color	Color Code
White/Gray	WG
White	WH
Ivory	IV
Almond	AL
Light Almond	LA
Black	BL

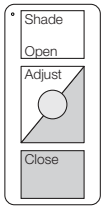
Note: On the White/Gray *Pico*, the circular preset button is silver, the top and raise button are white, and the bottom and lower buttons are gray. All other offerings have uniform button colors.

Pico Control Button Marking Codes:

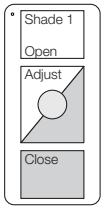
Button Marking Options	Marking Code
Light	01
Shade	02
Shade1	05
Shade2	06
Screen	07
Drape	08
Blackout	09
Sheer	10



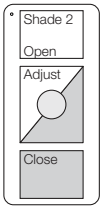
Light
(01)



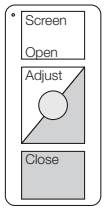
Shade
(02)



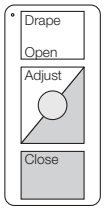
Shade 1
(05)



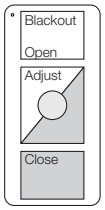
Shade 2
(06)



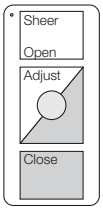
Screen
(07)



Drape
(08)



Blackout
(09)

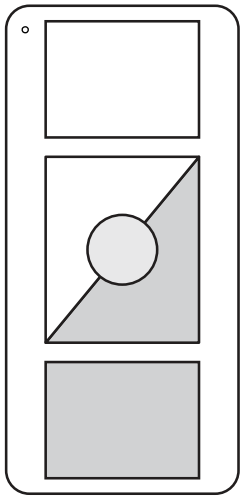


Sheer
(10)

Job Name:	Model Numbers:
Job Number:	

Pico™ Wireless Control and Tabletop Pedestal

The *Pico* Wireless Control is a flexible and easy to use device that allows the user to control Sivioia® QS wireless shades and drapes, and Radio Ra®-SR lighting devices. The *Pico* can function as a tabletop control on a pedestal, a lightweight handheld remote, or it can be wall-mounted within a Lutron Claro® faceplate, to mimic a traditional keypad. The battery operated control requires no external power or communication wiring.



Pico Wireless Control

Features

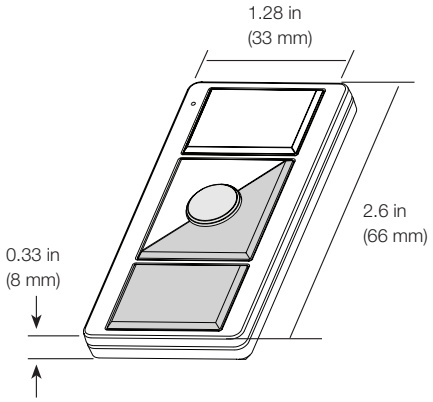
- Provides control for a *Sivoia* QS wireless shading system, *RadioRa*-SR system and GRAFIK Eye® QS wireless system, allowing users to:
  - Open and close shades or drapes, or turn lights on and off
  - Raise and lower shades, drapes, or lighting levels
  - Recall a favorite shade or drape position, or lighting level.
- Control of one or more zones on the *GRAFIK Eye* QS Wireless: turns zone(s) on or off, raises/lowers zone(s), and goes to user-programmable preset level
- Scene control: the *Pico* wireless control can access scene 1, scene 16, and OFF on the *GRAFIK Eye* QS, and can raise and lower lighting levels
- Control available in 6 colors and 8 button marking options to suit a variety of applications
- Easy reconfiguration for use as a handheld control, wall-mount control, or table top control using the optional pedestal.
- Simply install as a 1-gang or 2-gang installation with the included wall mount adapter and mounting template
- Tabletop pedestal available in both single and dual configurations in black and white
- Battery powered control (battery included)
- Can provide control to unlimited number of shades, drapes or lighting devices within a 30 ft (9 m) range.

LUTRON® SPECIFICATION SUBMITTAL Page 1

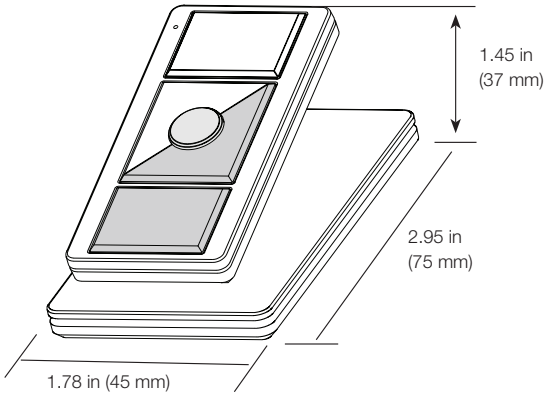
Job Name:	Model Numbers:
Job Number:	

Dimensions

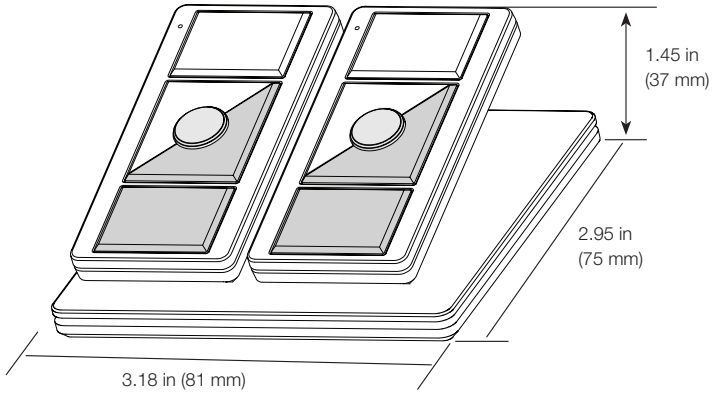
Pico Control



Single Pedestal

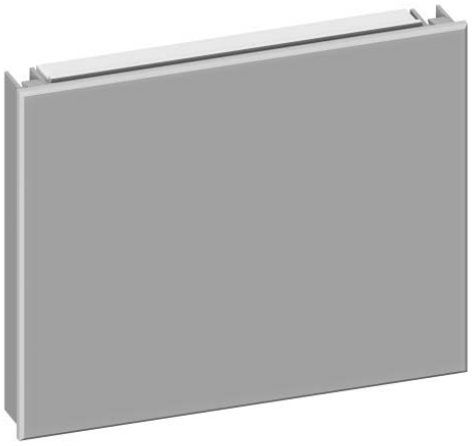


Dual Pedestal



Job Name:	Model Numbers:
Job Number:	

Switching Power Module



Description

- Provides capability for a zone on a *GRAFIK Eye* control unit (or other product) to switch a fully loaded circuit of lighting.
- May be used to switch incandescent, electronic low-voltage, magnetic low-voltage, HID, fluorescent ballasts, and neon/cold cathode lighting sources.
- Utilizes Softswitch® arcless switching technology.
- Provides power and switching for one zone.
- Up to 3 power modules may be wired on a single *GRAFIK Eye* zone.
- Model available for 120 V~ control power.
- Model available for 120 - 277 V~ load power.

Works with:

- Lutron 3-wire fluorescent dimmers (consult Lutron for Vierti®); see approved list in the wallbox lighting catalog at www.lutron.com/wallboxcatalog
- *GRAFIK Eye* QS control units
- *GRAFIK Eye* 3000 Series control units
- LP, LCP, and GP dimming panels
- HomeWorks® remote power panels

Model and Capacities

Control Power	Load Power	Capacity	Model Number
120 V~	120 - 277 V~	16 A	PHPM-SW-DV-WH

Specifications

Power

- Control / load power:
  120 V~ / 120 - 277 V~
  50 / 60 Hz, phase-to-neutral.
- Load (output) power: Phase independent of control unit.

Sources/Load Types

- Switches the following load types:
  – Incandescent (tungsten)
  – Halogen
  – Magnetic low-voltage transformer (iron core)
  – Electronic (solid-state) low-voltage transformer.
  – Magnetic and electronic fluorescent dimming ballasts
  – Neon/cold-cathode
  – HID
- Motors:
  – 1/2 HP at 277 V~
  – 1/3 HP at 120 V~
- May be used with GFI/AFI breaker protected loads.

Key Design Features

- Patented Softswitch® technology.
- Two LEDs on front of unit provide diagnostic information (visible when faceplate is removed).

Terminals

Accept up to two #12 AWG (2.5 mm^2).

Environment

- 32 - 104 °F (0 - 40 °C). Relative humidity less than 90% non-condensing.
- Maximum BTU/hour of module: 15

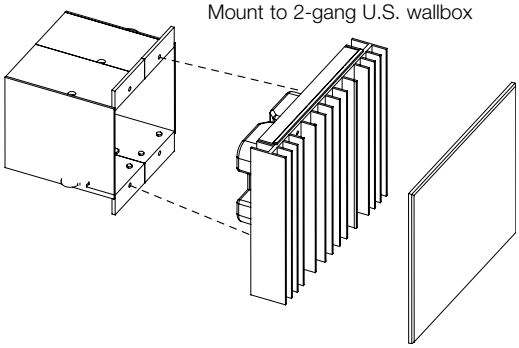
Mounting

- Surface or recess mount indoors only.
- Power module is UL tested and approved for use in air plenums.

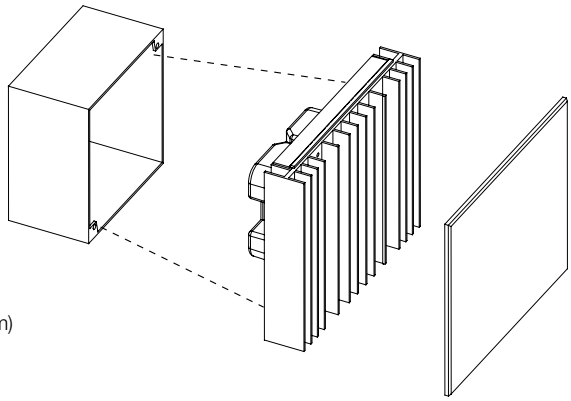
Dimensions and Mounting

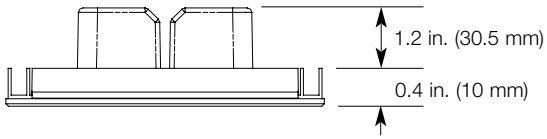
- Mount in 2-gang U.S. wallbox 3.5 in. (89 mm) deep or 4 x 4 in. (102 mm) junction box 2.1 in. deep (53 mm). Indoors only.
- Mount only where ambient temperature is 32-104 °F (0-40 °C).
- Allow 4.5 in. (114 mm) above and below unit and between faceplates when mounting several in a vertical layout.
- Mount so line (mains) voltage wiring is at least 6 ft. (1.8 m) from sound or electronic equipment and wiring.
- Mount within 7° of true vertical.

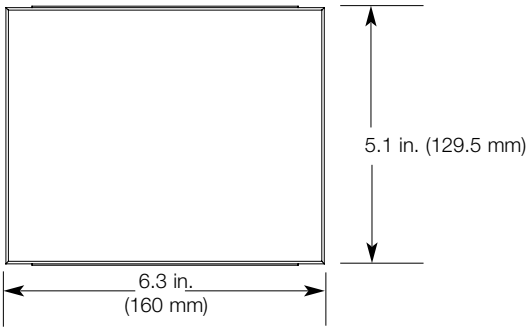
Mount to 2-gang U.S. wallbox



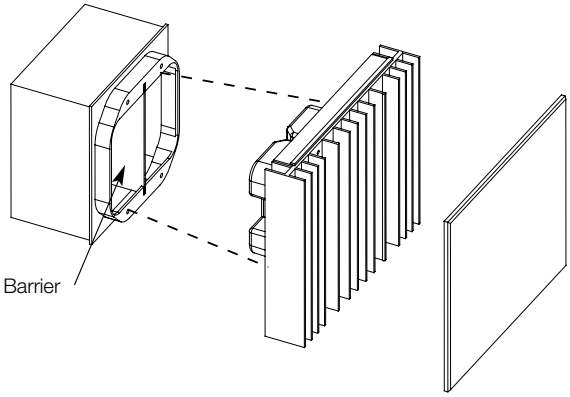
Mount to 4 x 4 in. (102 mm), 2.1 in. (53 mm) deep U.S. junction box







Mount to 4 x 4 in. (102 mm), 2.1 in. (53 mm) deep U.S. junction box with barrier (for 277 V~ loads if required by local electrical code)



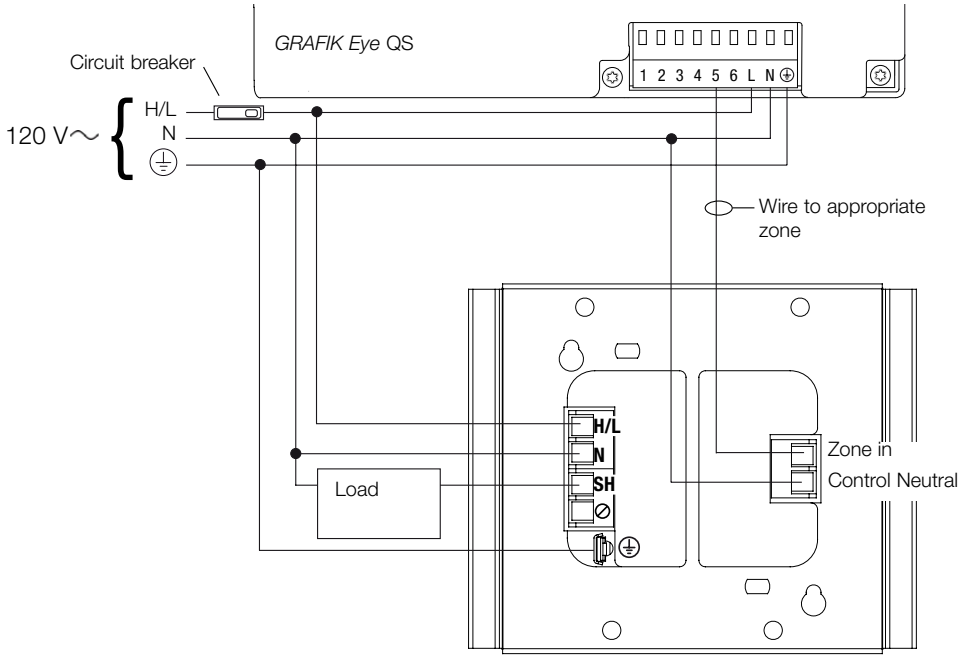
Job Name:	Model Numbers:	
Job Number:		

Wiring

- Pull #12 AWG (2.5 mm²) copper (Cu) wires (75 °C minimum) for input power and load circuit.
- Strip 1/2 in. (12 mm) insulation from wires before connecting.
- Run separate neutral for load circuit - no common neutrals.

Single Power Feed

Note: The power modules may be on the same circuit as the control unit only if the total load does not exceed the rating of the breaker.



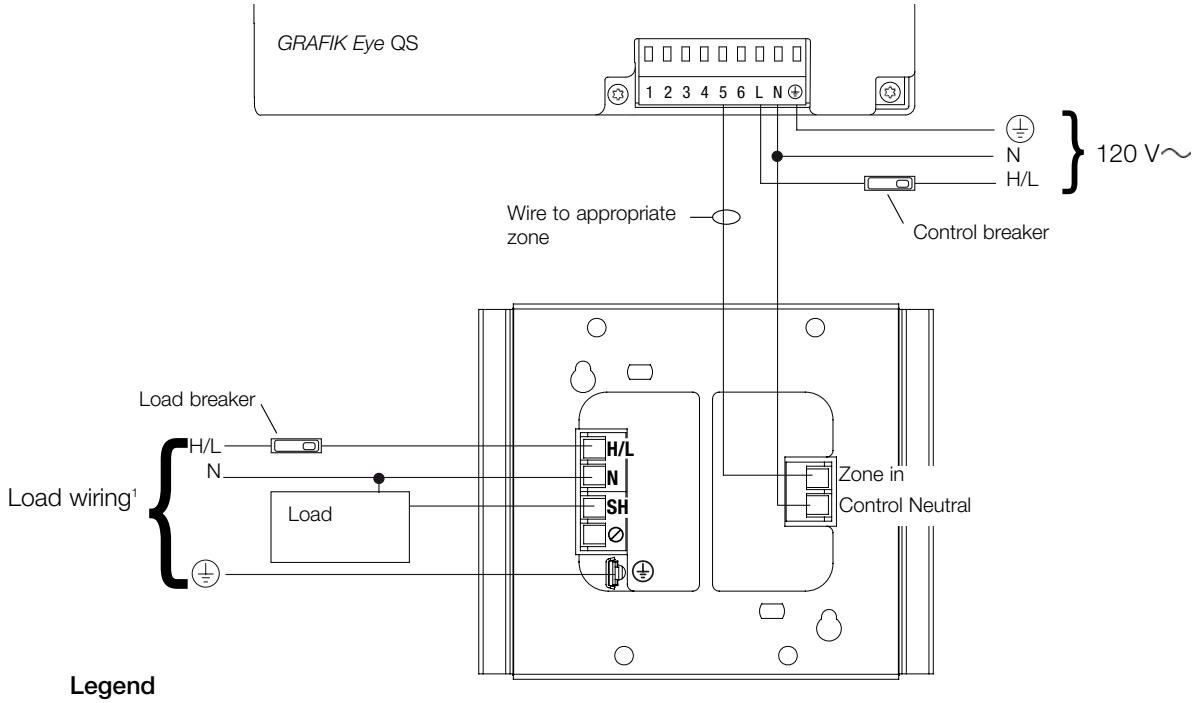
Legend

H/L	Hot/Live
N	Neutral
SH	Switched Hot
DH	Dimmed Hot
⏚	Ground
⊘	Not Used

Wiring

Multiple Power Feeds

The load breaker may be on a different phase than the control breaker.



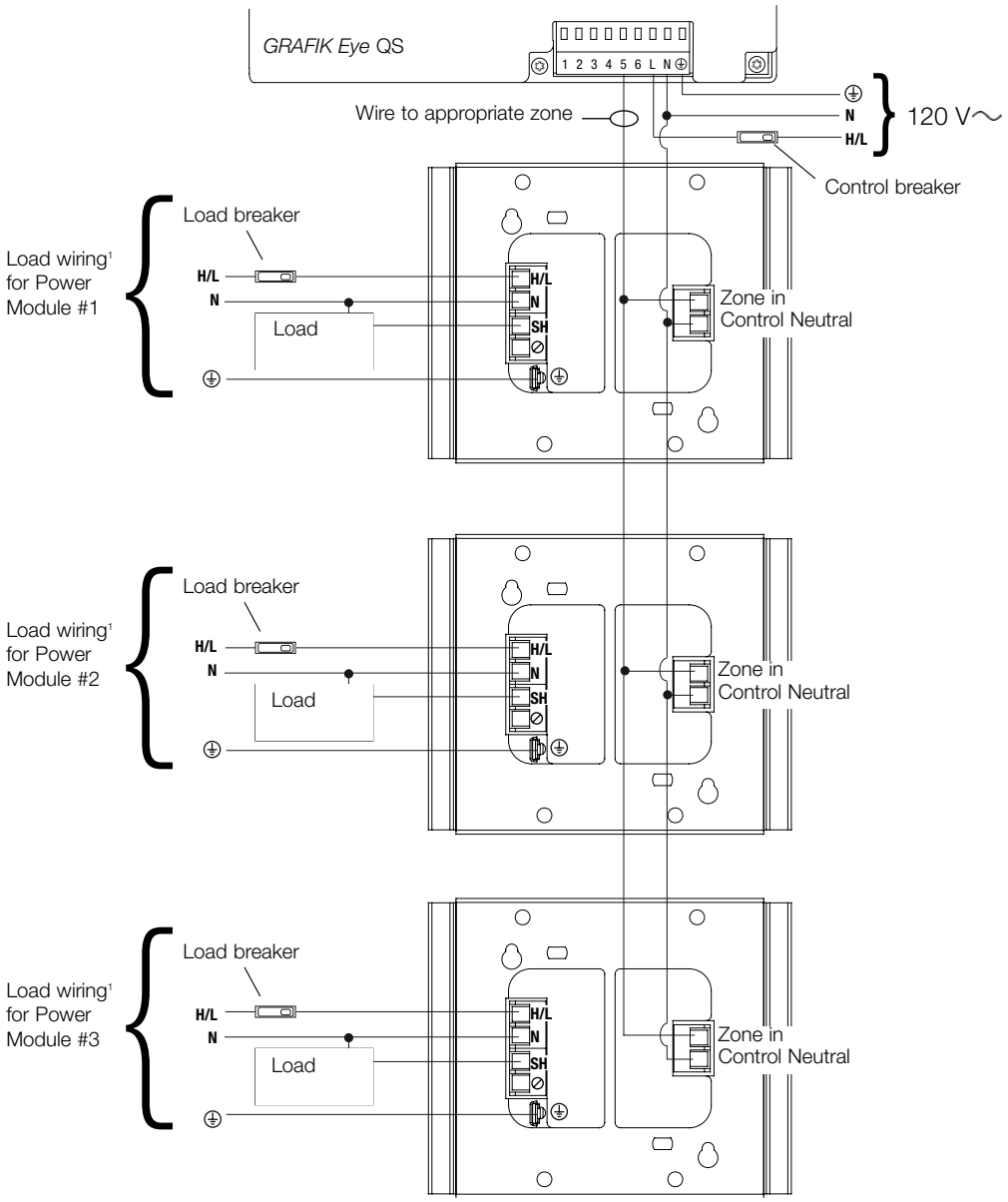
Legend

H/L	Hot/Live
N	Neutral
SH	Switched Hot
DH	Dimmed Hot
⏚	Ground
⊘	Not Used

[1]Load feed: 120 V~ for PHPM-3F-120-WH; 120 or 277 V~ for PHPM-3F-DV-WH

Wiring Multiple Power Modules to a Single GRAFIK Eye® Zone

Shown with separate feeds for control and loads. All breakers must be turned off prior to installing or servicing the modules. Up to 3 power modules may be wired to a single zone.



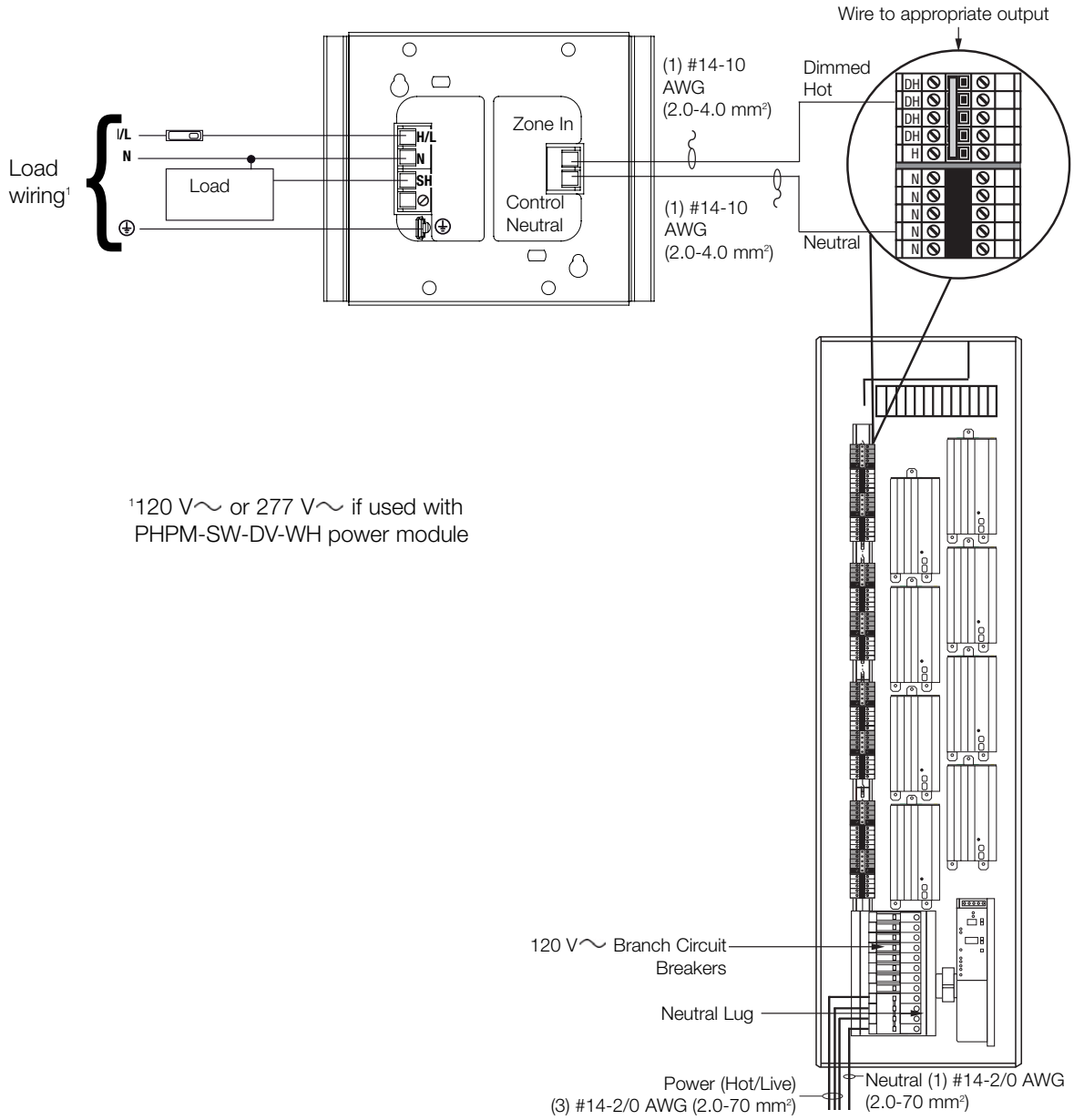
[1]Load feed: 120 V~ or 277 V~ for PHPM-SW-DV-WH

LUTRON® SPECIFICATION SUBMITTAL Page 6

Job Name:	Model Numbers:	
Job Number:		

Wiring a Power Module to an LP or LCP Panel

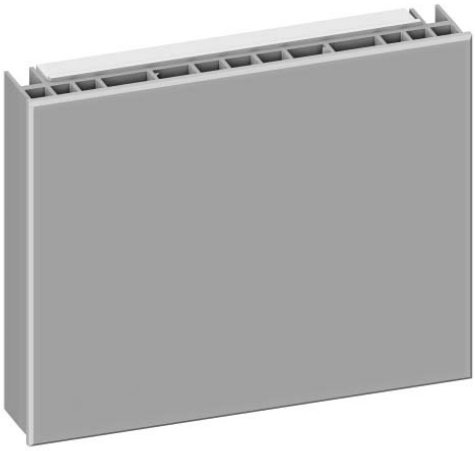
Up to three switching power modules may be wired to an output of a 120 V~ LP or LCP panel. The load type for the output must be set as non-dim load type on the panel's circuit selector (for an LP panel) or controller (for an LCP panel).



[1]120 V~ or 277 V~ if used with PHPM-SW-DV-WH power module

Job Name:	Model Numbers:	
Job Number:		

Phase-Adaptive Power Module



Description

- Provides capability for a zone on a *GRAFIK Eye* control unit (or other product) to dim a fully loaded circuit of lighting.
- May be used to control incandescent, electronic low-voltage, magnetic low-voltage, and neon/cold cathode lighting sources, as well as Lutron Tu-Wire® fluorescent dimming ballasts.
- Automatically selects leading-edge or trailing-edge dimming for low-voltage transformers.
- Provides power and dimming for one zone.
- Up to 3 power modules may be wired on a single *GRAFIK Eye* zone.
- Models available for 120 V~ control power.
- Models available for 120 V~ or 120 - 277 V~ load power.
- Not for use with non-dim loads.

Works with:

- Lutron 3-wire fluorescent dimmers (consult Lutron for Vierti®); see approved list in the wallbox lighting catalog at www.lutron.com/wallboxcatalog
- *GRAFIK Eye* QS control units
- *GRAFIK Eye* 3000 Series control units
- LP, LCP, and GP dimming panels
- HomeWorks® remote power panels

Model and Capacities

Control Power	Load Power	Capacity	Model Number
120 V~	120 - 277 V~	16 A	PHPM-PA-DV-WH
120 V~	120 V~	16 A	PHPM-PA-120-WH

LUTRON® SPECIFICATION SUBMITTAL Page 1

Job Name:	Model Numbers:	
Job Number:		

Specifications

Power

- Control / load power:
  120 V⁓ / 120 V⁓
  120 V⁓ / 120 - 277 V⁓
  50 / 60 Hz, phase-to-neutral.
- Load (output) power: Phase independent of control unit.

Sources/Load Types

- Operates these sources with a smooth continuous Square Law dimming curve:
  – Incandescent (tungsten)
  – Halogen
  – Magnetic low-voltage transformer (iron core)
  – Electronic (solid-state) low-voltage transformer (must be manufacturer approved for reverse-phase control dimming).
  – Lutron Tu-Wire® electronic fluorescent dimming ballast
  – Neon/cold-cathode
- Incandescent and electronic low-voltage sources may be controlled on the same zone. Up to 30% of the unit's capacity may be used for incandescent lighting.
- Not for use with non-dim loads. Use switching power module for non-dim loads.
- Minimum load on power module is 10 W.

Key Design Features

- Automatically selects between forward phase/leading edge (e.g., magnetic low-voltage) and reverse phase/trailing edge (e.g., electronic low-voltage) dimming based on load.
- Patented RTISS™ circuitry compensates in real time for incoming line voltage variations: Compensates for +/-2% change in RMS voltage/cycle and +/-2% Hz change in frequency/second.
- Provides air-gap off.
- Module protects itself during temporary over-current and over-voltage conditions.
- Two LEDs on front of unit provide diagnostic information (visible when faceplate is removed).

Terminals

Accept up to two #12 AWG (2.5 mm^2).

Environment

- 32 - 104 °F (0 - 40 °C). Relative humidity less than 90% non-condensing.
- Maximum BTU/hour of module: 135

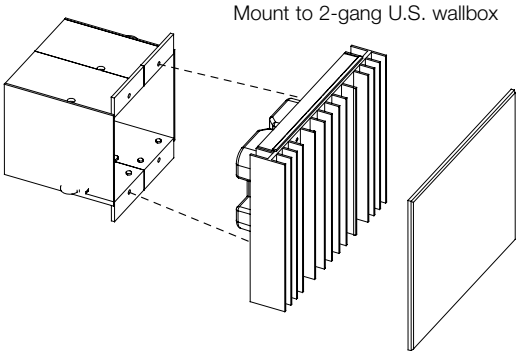
Mounting

- Surface or recess mount indoors only.
- Power module is UL tested and approved for use in air plenums.

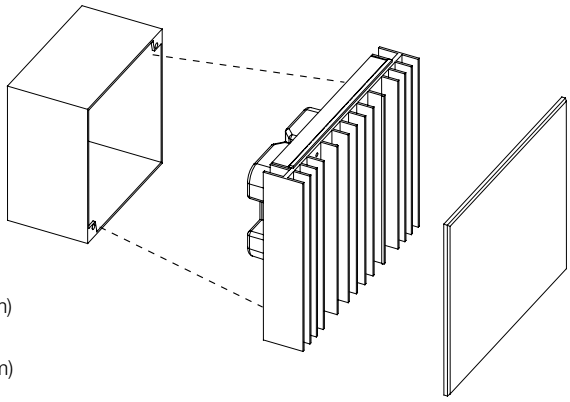
Dimensions and Mounting

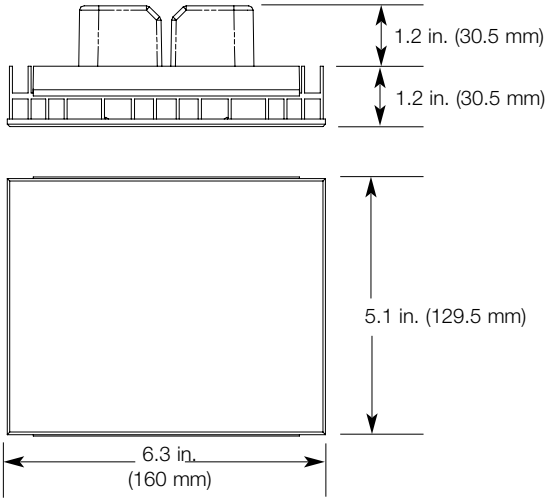
- Mount in 2-gang U.S. wallbox 3.5 in. (89 mm) deep or 4 x 4 in. (102 mm) junction box 2.1 in. deep (53 mm). Indoors only.
- This device generates heat; mount only where ambient temperature is 32 - 104 °F (0 - 40 °C).
- Mount with arrows facing up to ensure adequate cooling.
- Allow 4.5 in. (114 mm) above and below unit and between faceplates when mounting several in a vertical layout.
- Mount so line (mains) voltage wiring is at least 6 ft. (1.8 m) from sound or electronic equipment and wiring.
- Mount within 7° of true vertical.

Mount to 2-gang U.S. wallbox

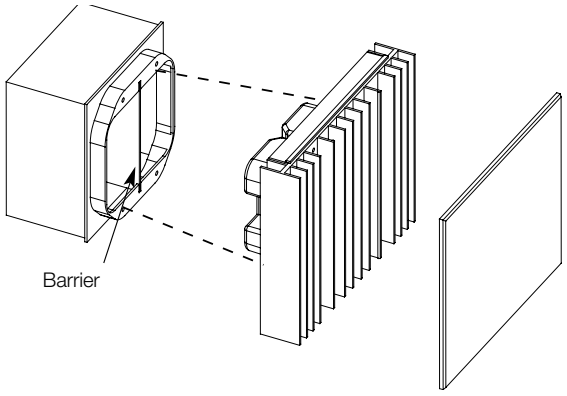


Mount to 4 x 4 in. (102 mm), 2.1 in. (53 mm) deep U.S. junction box





Mount to 4 x 4 in. (102 mm), 2.1 in. (53 mm) deep U.S. junction box with barrier (for 277 V~ loads if required by local electrical code)



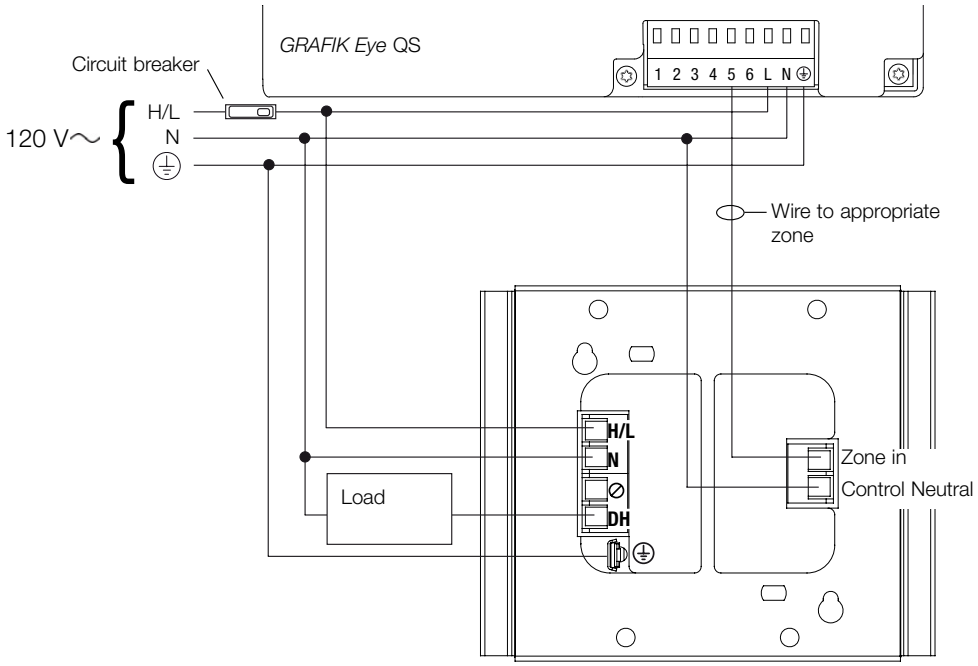
Job Name:	Model Numbers:	
Job Number:		

Wiring

- Pull #12 AWG (2.5 mm²) copper (Cu) wires (75 °C minimum) for input power and load circuit.
- Strip 1/2 in. (12 mm) insulation from wires before connecting.
- Run separate neutral for load circuit - no common neutrals.
- May be used with GFI breaker protected loads. Load circuit wiring (from GFI breaker to power module to load) must be run in its own non-metallic conduit, or nuisance tripping may occur. Maximum 100 ft. (30.5 m) between power module and load.
- May be used with AFI breaker protected loads. Maximum load on AFI circuit is 1000 W. Exceeding 1000 W may cause nuisance tripping of AFI breaker.

Single Power Feed

Note: The power module may be on the same circuit as the control unit only if the total load does not exceed the rating of the breaker.



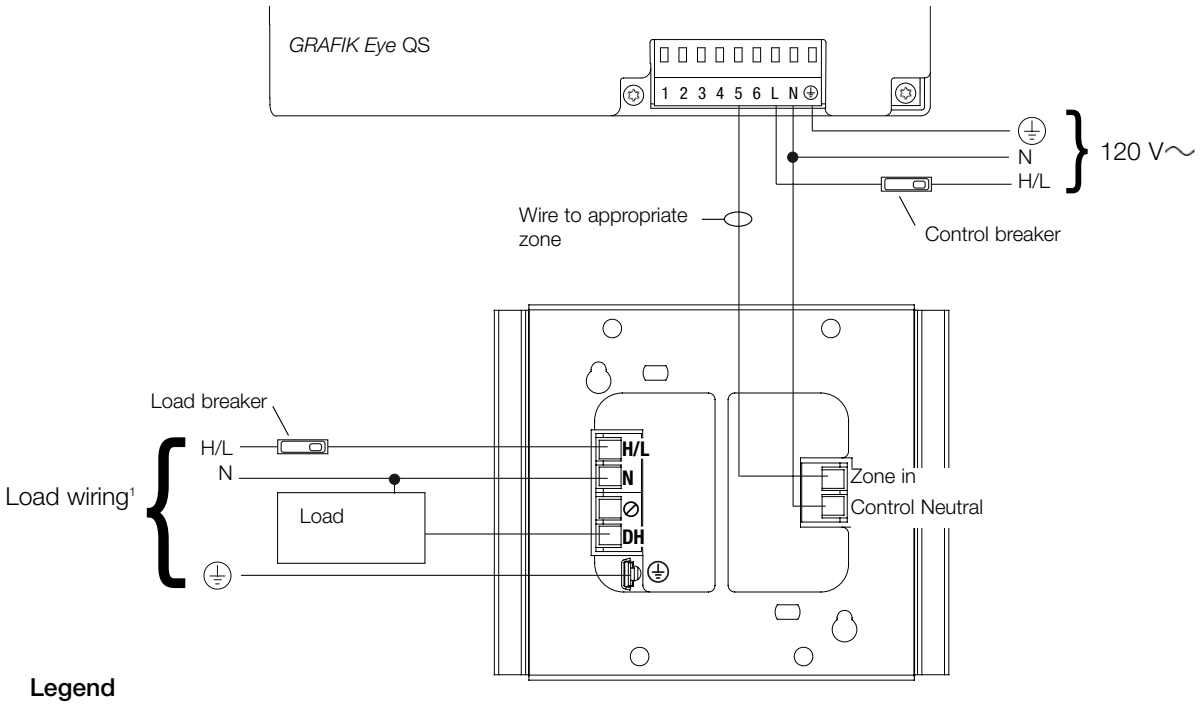
Legend

H/L	Hot/Live
N	Neutral
SH	Switched Hot
DH	Dimmed Hot
⏚	Ground
⊘	Not Used

Wiring

Multiple Power Feeds

The load breaker may be on a different phase than the control breaker.



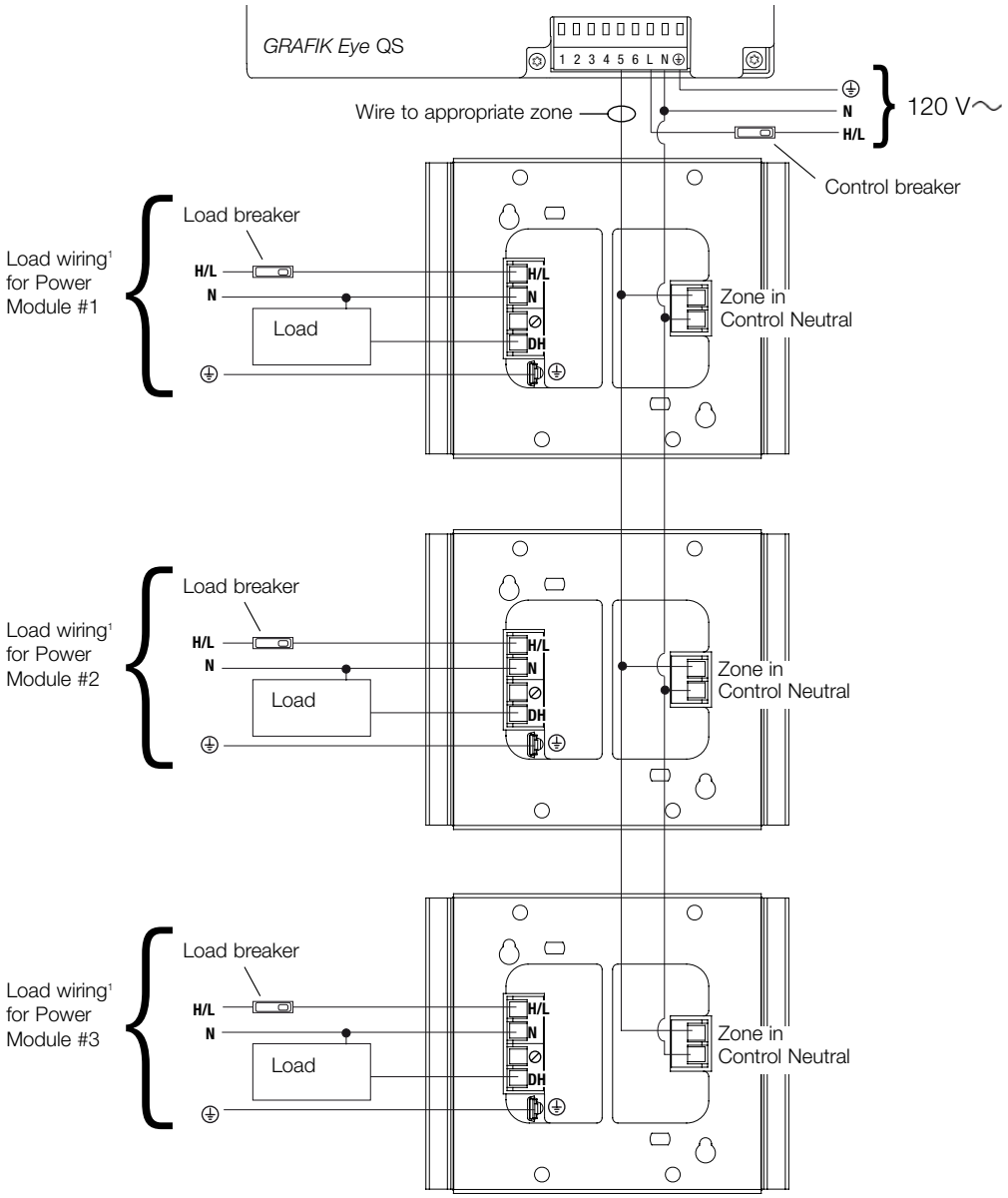
Legend

H/L	Hot/Live
N	Neutral
SH	Switched Hot
DH	Dimmed Hot
⏚	Ground
⊘	Not Used

[1]Load feed: 120 V~ for PHPM-PA-120-WH; 120 or 277 V~ for PHPM-PA-DV-WH

Wiring Multiple Power Modules to a Single GRAFIK Eye® Zone

Shown with separate feeds for control and loads. All breakers must be turned off prior to installing or servicing the modules. Up to 3 power modules may be wired to a single zone.



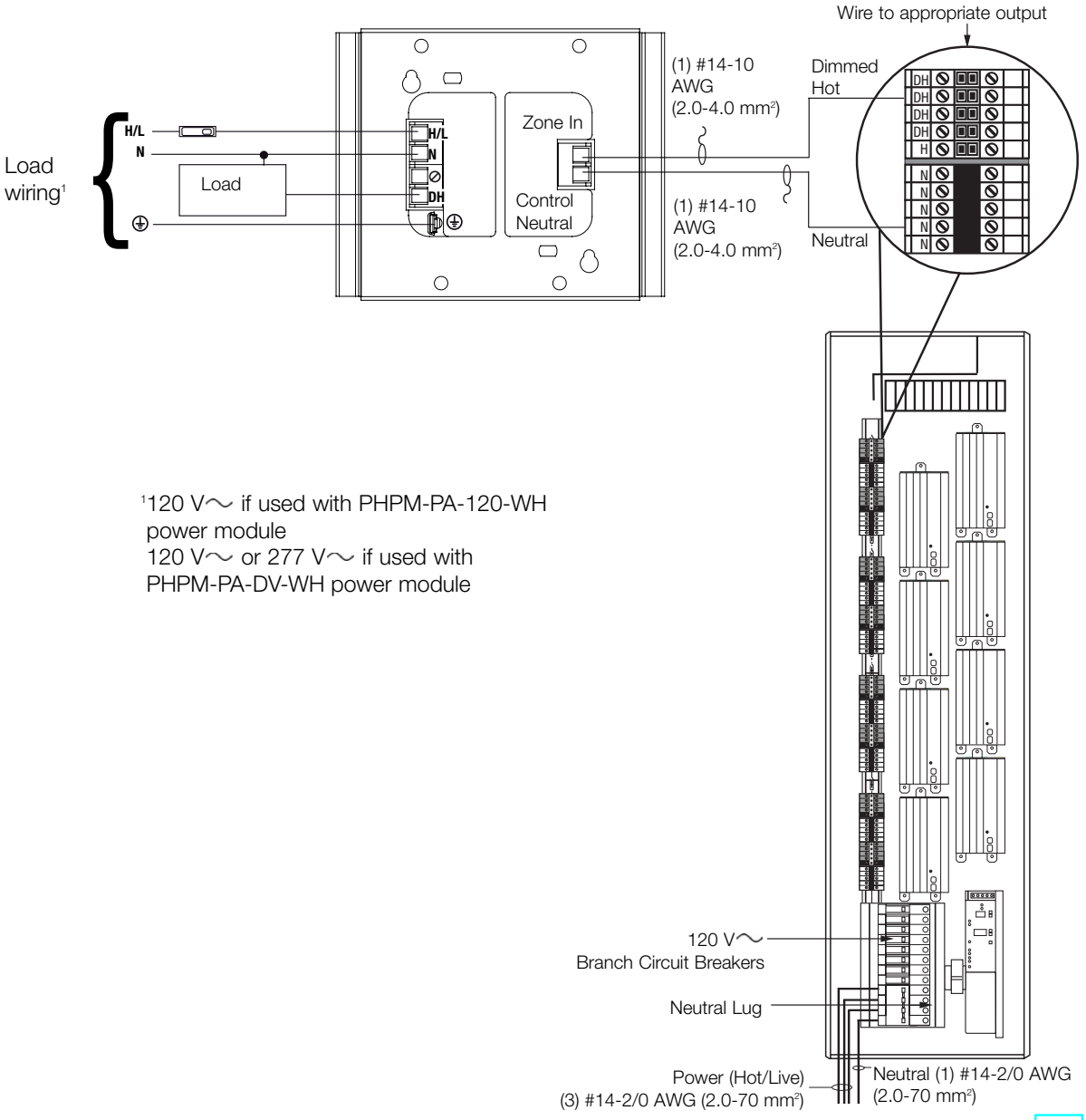
[1]Load feed: 120 V~ for PHPM-PA-120-WH; 120 or 277 V~ for PHPM-PA-DV-WH

LUTRON® SPECIFICATION SUBMITTAL Page 6

Job Name:	Model Numbers:	
Job Number:		

Wiring a Power Module to an LP or LCP Panel

Up to three phase-adaptive power modules may be wired to an output of a 120 V~ LP or LCP panel. The load type for the output must be set appropriately on the panel's circuit selector (for an LP panel) or controller (for an LCP panel).



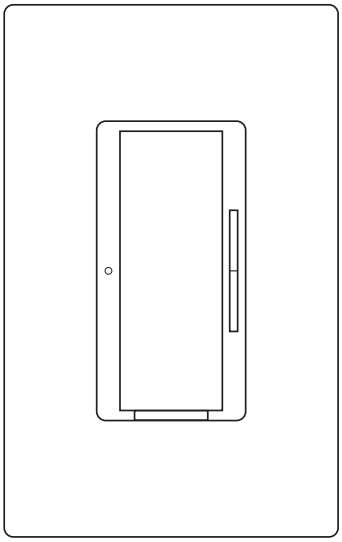
[1]120 V~ if used with PHPM-PA-120-WH power module
120 V~ or 277 V~ if used with PHPM-PA-DV-WH power module

Job Name:	Model Numbers:	
Job Number:		

EcoSystem™	CC-1BRL-WH	1-Button Wallstation

CC-1BRL-1 2.19.08

1-Button Wall Control with Raise/Lower



The 1-Button Wallstation functions as an individual or group control of EcoSystem ballasts or ballast modules and provides a programming point for all devices in the system. The wallstation connects directly to the EcoSystem ballast or ballast module via low voltage wiring.

Features

- Wires Class 2 Low Voltage
- Mounts easily in any single-gang wallbox
- Fits any designer (*Claro*®) opening faceplates
- On/Off Tapswitch
- Single tap to return to preset level or double tap to full on
- Raise/Lower rocker
- Built-in infrared receiver allows wallstation to be used as a programming point for EcoSystem
- Infrared signals are received through the plastic button (maximum distance of 5 feet)
- Programming of control groups can be performed at the wallstation
- Multi-color LED to indicate button presses, programming mode, and reception of infrared signals
- Green LED shall be on at all times and operate as a “night light”
- Red LED shall indicate programming mode is active
- Faceplate not included

LUTRON® SPECIFICATION SUBMITTAL Page 1

Job Name:	Model Numbers:	
Job Number:		

EcoSystem™	CC-1BRL-WH	1-Button Wallstation

CC-1BRL-2 2.19.08

Specifications

Standards

- Designed for Class 2 operation only. Voltages do not exceed 35VDC. Complies with requirements of NFPA 70, of the National Electric Code (NEC).
- Follow all applicable national and/or local wiring regulations when installing this wallstation.
- For use with EcoSystem products only.

Mechanical

- Gloss finish available in white & ivory
- LED flashes in response to button presses and programming commands.
- IR transmissions received through plastic button. (maximum distance = 5 feet)

Notes

- Mounts easily in any single-gang wallbox.
- Has screw terminals for wire connections.
- Total wire length from sensor to device must not exceed 50 feet (15m).

Power

- Operating Voltage: Low-voltage Class 2, 20VDC
- Output Signal: 0 - 20VDC
- Current Draw: 25mA maximum

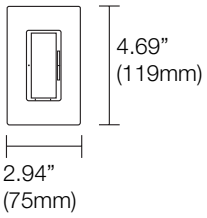
Environment

- Temperature: 32-113°F (0-45°C)
- Relative humidity: less than 90% non-condensing.

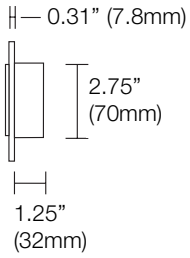
Dimensions

- Including *Claro* wallplate (sold separately)

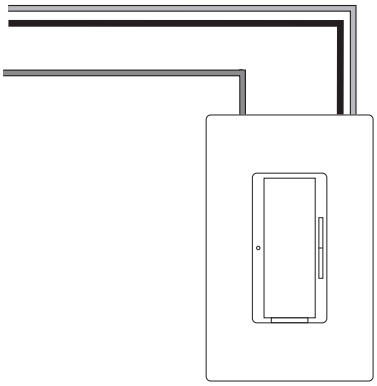
Front



Profile



Wiring



Wiring to EcoSystem Ballast or Ballast Module

- Wire color designations:
  Red = 20VDC
  Black = Common
  Blue = Signal (IR input terminal of Ballast or Module)
- Make sure that the supply breaker for the EcoSystem device to which the control will be connected is OFF.
- Connect the three conductors to the appropriate terminals of the EcoSystem ballast or ballast module.

LUTRON® SPECIFICATION SUBMITTAL Page 2

Job Name:	Model Numbers:	
Job Number:		

Dual Technology Ceiling Mount Sensor

The LOS-CDT Series ceiling-mount dual-technology sensors can integrate into Lutron systems or function as stand-alone controls using a Lutron power pack. The technology eliminates manual sensitivity and timer adjustments during installation and over the life of the product.

Features

- Intelligent, continually adapting sensor
- Ultrasonic (US) combined with passive infrared (PIR) sensing provide high sensitivity, high noise immunity, and excellent false tripping immunity
- Suited for complex environments that are difficult to control with single-technology sensors
- Snap-locks to ceiling-mounted cover plate
- Non-Volatile Memory: settings saved in protected memory are not lost during power outages
- 500 to 2000 sq.ft. (46 to 186 m^2) coverage when mounted on an 8 - 12 ft. (2.4 to 3.7 m) ceiling; 180° and 360° field of view
- Affords choice of turning lights off or dimming to a preset level in the unoccupied state when integrated with a Lutron system.

Models Available

Cat. No.	Color	Coverage	Field of View
LOS-CDT-500-WH	White	500 sq.ft. (46 m^2)	180°
LOS-CDT-500R-WH	White	500 sq.ft. (46 m^2)	180°
LOS-CDT-1000-WH	White	1000 sq.ft. (93 m^2)	180°
LOS-CDT-1000R-WH	White	1000 sq.ft. (93 m^2)	180°
LOS-CDT-2000-WH	White	2000 sq.ft. (186 m^2)	360°
LOS-CDT-2000R-WH	White	2000 sq.ft. (186 m^2)	360°

Self-Adaptive Feature

The LOS-CDT Series ceiling-mount occupant sensors combine both (US) motion detection for maximum sensitivity and passive infrared (PIR) motion detection for false triggering immunity. The self-adapting internal microprocessor analyzes the composite sum of both signals to eliminate time-consuming adjustments and callbacks found in non-intelligent sensors.

LUTRON SPECIFICATION SUBMITTAL Page 1

Job Name:	Model Numbers:	
Job Number:		

Specifications

Timer Adjustment

- Automatic mode: Continually adapting sensor automatically adjusts settings to the space
- Manual mode: 8 to 30 minutes
- Test mode: 8 seconds

LED Lamp

- Red: infrared motion detected
- Green: ultrasonic motion detected

Housing

- Rugged, high-impact, injection-molded plastic
- Color-coded leads 6 in. (15 cm)

Power

- Operating voltage: 20 - 24 V⎓, PELV (Class 2: USA) low-voltage
- Operating current: 33 mA nominal
- Control output: 20 - 24 V⎓ active high logic control signal with short-circuit protection, open collector when unoccupied

Operating Environment

- Temperature: 32 to 104 °F (0 to 40 °C)
- Relative humidity: less than 95%, non-condensing
- For indoor use only

Adaptive Functions

- Installation: 60 minutes
- Learning: 4 weeks for response to error conditions, air current adaptation, and timer optimization
- Post-learning occupancy periods
  - —24-hour circadian occupancy periods learned
  - —Weekly occupancy periods learned
- Adjustments in post-learning period
  - —Generally occupied periods (threshold = high-sensitivity mode)
  - —Generally unoccupied periods (threshold = miser mode)

Contact Rating (R Models only)

- SPDT 500 mA rated at 24 V⎓ isolated relay

Photo Cell (R Models only)

- Prevents light from turning on when there is sufficient natural light
- Sensitivity: 0 - 1,000 LUX adjustable

Dimensions

Front View

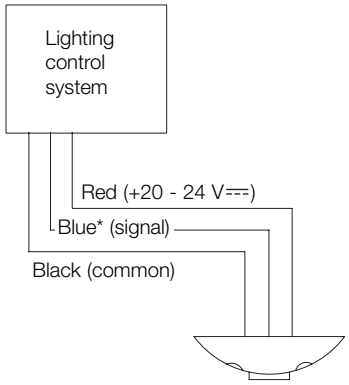
Side View

Measurements are in inches (mm)

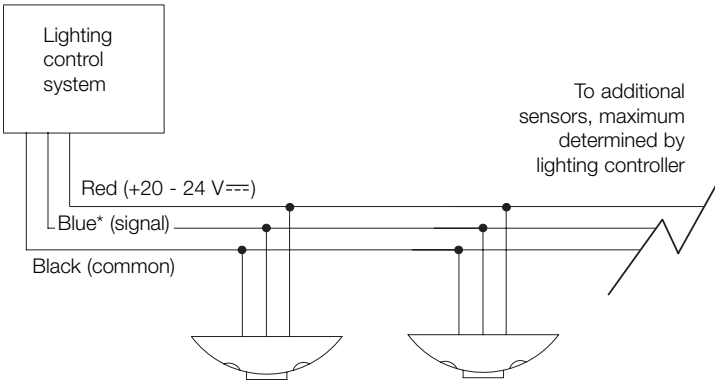
Wiring

Note: Power pack may be required when interfaced to lighting control system; see below.

Single Sensor to System



2 or More Sensors to System



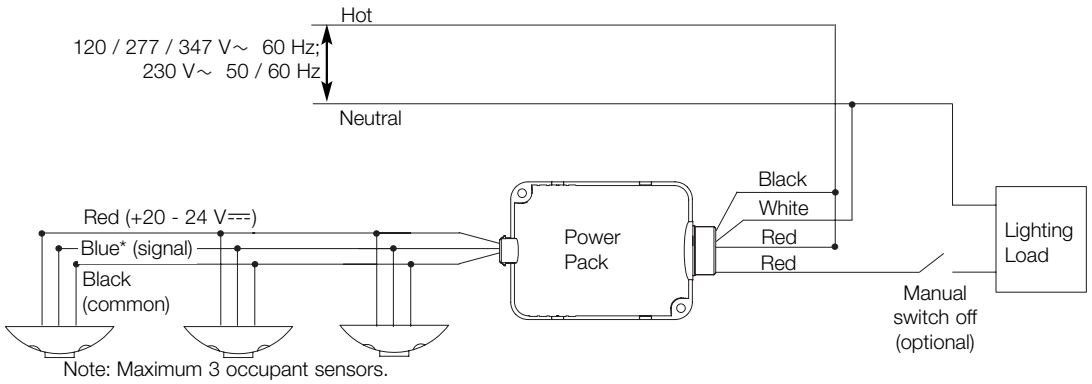
*Note: Use gray wire for -R model.

Power Supply Options

Lutron Lighting Control System	Power Pack Required?
Digital microWATT™	No
EcoSystem®	No
GRAFIK 5000 / 6000 / 7000™	No, when used with seeTouch® wallstations with occupant sensor connections.
GRAFIK Eye® 3000 / 4000	Yes
HomeWorks®	Yes
LCP128™	No, when used with *seeTouch* wallstations with occupant sensor connections.
microWATT®	No
RadioRA®	Yes
RadioTouch®	No
Softswitch128®	No, when used with *seeTouch* wallstations with occupant sensor connections.

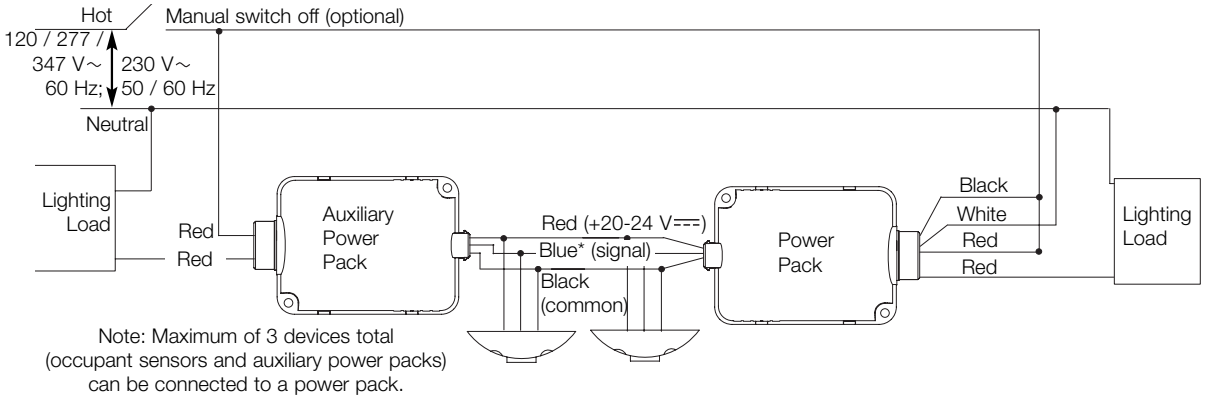
Wiring: Stand-Alone Control

1 to 3 Sensors with Power Pack



Note: Maximum 3 occupant sensors.

Switching Multiple Loads with Auxiliary Power Packs



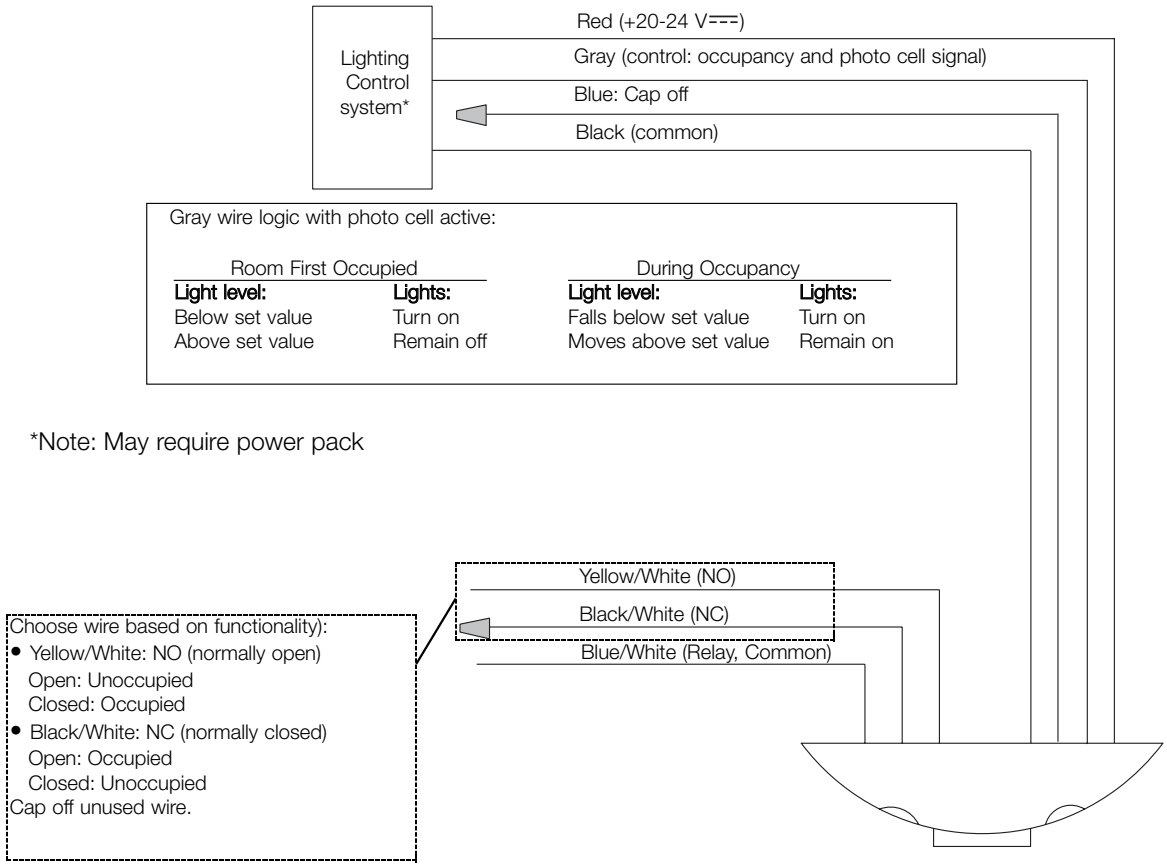
Note: Maximum of 3 devices total (occupant sensors and auxiliary power packs) can be connected to a power pack.

*Note: Use gray wire for -R model.

Wiring

Relay Model Option

LOS-CDT-xxxxR only



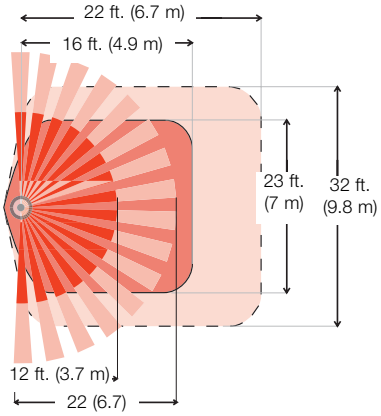
*Note: May require power pack

Installation

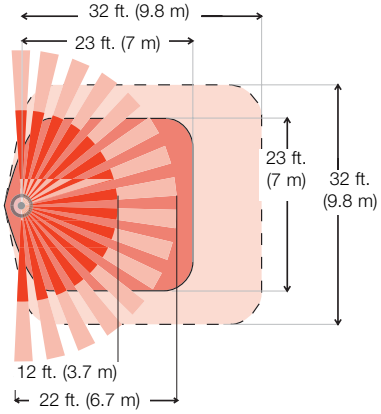
Sensor Placement

- The occupant sensor must have an unobstructed view of the room. Do not mount behind or near tall cabinets, shelves, indirect hanging fixtures, etc.
- Keep the occupant sensor away from air flow from ventilation outlets, windows, fans, etc.
- If installing a 180° occupant sensor (500 and 1000 models), place the sensor on the same wall as the doorway so that traffic in a hallway will not affect the sensor; otherwise, place in center of room.
- Closely follow the diagrams shown concerning major and minor motion coverage. The sensor can detect major motion (such as a person taking a half-step) at a greater distance than it can detect minor motion (such as writing or typing at a desk).
- Decrease total coverage area by 15% for “soft” rooms (for example, heavy draperies or heavy carpeting).

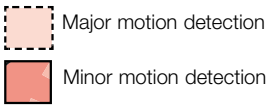
Range Diagrams

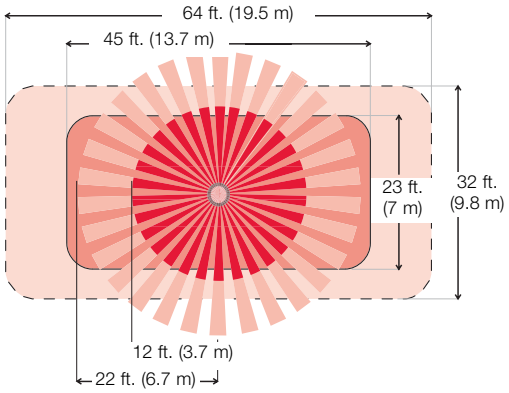


LOS-CDT-500



LOS-CDT-1000





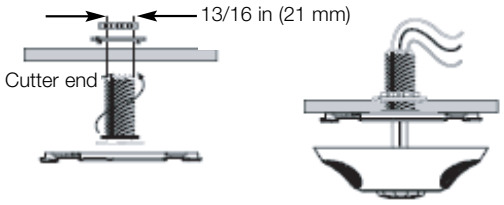
LOS-CDT-2000

Installation

Mounting

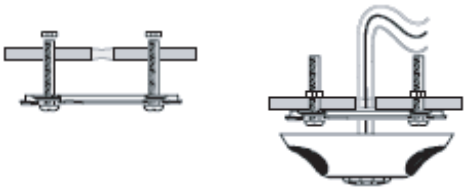
Normal Mounting

Twist and lock threaded mounting post onto cover plate. Drill through ceiling tile with assembly, using cutter end of the threaded mounting post. Secure with washer and nut.



Mounting to Non-Standard Ceiling or Fixture

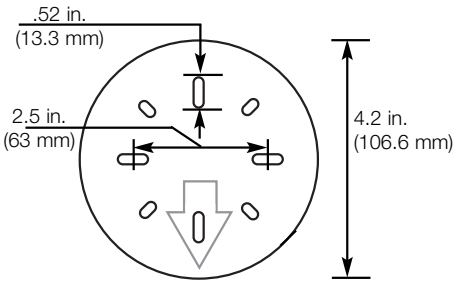
Mount twist-lock cover plate using mounting screws, nuts, and washers (included). Drill/punch wire routing hole through ceiling tile at center of cover plate.



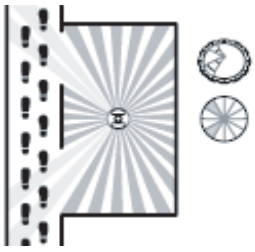
Wire Lengths

# Sensors	1	2	3	1	2	1
# Aux. PP	0	0	0	1	1	2
22 AWG	750 ft.	375 ft.	250 ft.	375 ft.	250 ft.	250 ft.
0.5 mm²	365 m	180 m	120 m	90 m	120 m	120 m
20 AWG	1200 ft.	600 ft.	400 ft.	600 ft.	400 ft.	400 ft.
0.75 mm²	730 m	365 m	240 m	365 m	240 m	365 m
18 AWG	2400 ft.	1200 ft.	800 ft.	1200 ft.	800 ft.	800 ft.

Mounting Plate Dimensions



Using the Infrared Mask



Center Ceiling Mount
(Mask blocks sensor seeing out doorway into hall)

Corner Ceiling Mount
(No mask needed)

Typical Mask Patterns

Conference Room Mask | 180° Mask | Full Mask

Rectangular Areas | Over the Door | Specific Areas You Wish to Mask

LUTRON® SPECIFICATION SUBMITTAL Page 7

Job Name:	Model Numbers:	
Job Number:		

Sensor Adjustments

Override Settings

A	Off (Default)	On
Auto/Manual (1)	Automatic (Normal)	Manual on/off (Override)
Threshold (2)	Auto Threshold Adjustment	High Sensitivity (Low turn-on threshold)
LED Motion Indicator (3)	Lights indicate motion	Disable LED Indicator
Reset Learned Settings (4)	Retain Settings (Normal)	Erase all learned settings, restart Learning (Toggle On)

B	Off	On
Strong Airflow Compensation (1)	Disable Compensation (Normal)	Enable Compensation
Over Doorway Installation (2)	No (Normal)	Yes (Use increased turn-on threshold)
Timer Adjust (3)	Adjust Timer Automatically	Use Manual Setting (No adjustment)
Auto Sensitivity (4)	Adjust Sensitivity Automatically	Adjust Sensitivity Manually

Timer Test Mode

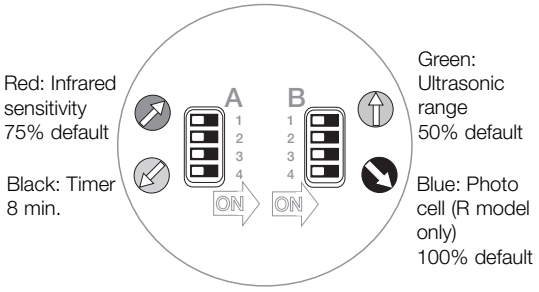
1. Remove the retainer cover.
2. Rotate the black timer adjustment knob to about midway (12 o'clock).
3. Return setting to minimum setting (full CCW).

Factory Settings | 12 o'clock | Full CCW

Note: The timer will remain in the 8-second test mode for 1 hour, then automatically reset to 8 minutes.

4. To manually take the timer out of the 8-second test mode, turn the timer adjustment approximately 1/16" clockwise to make the setting slightly above minimum (just above the 8-minute setting).

Factory Settings



Installation

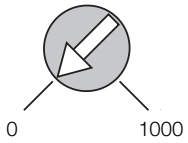
Adjusting the "Lights Not On" Level

LOS-CDT-xxxxR only

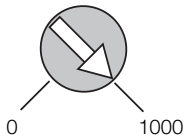
1. Place timer in Test Mode (see page 7).
2. Set photo cell to max.
   Turn the blue knob full clockwise (lights on no matter how bright the natural light is), then about 30 degrees counterclockwise.
3. Check for Lights-Out.
   Move from underneath the sensor, and remain still until the lights turn off. Move around normally to turn the light on.
4. Adjust to desired level.
   If lights remain off, adjust the blue knob another 30 degrees counterclockwise and repeat step 3 until the lights turn on.
   Note: Set blue knob to 100% to disable photo cell functionality and leave secondary dry contact closure output functionality intact.

Control Settings (Blue Knob)

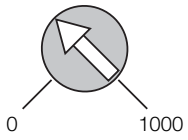
LOS-CDT-xxxxR only



Minimum (low):
Lights will never come on, even though room is occupied.



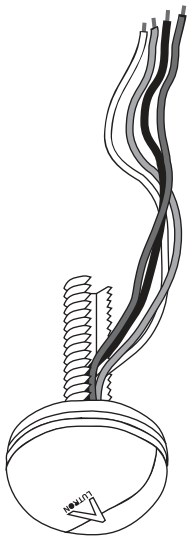
Maximum (high):
Photo cell has no effect on operation (factory setting).



Normal:
200 to 600 LUX is normal range.

Fixture Mountable Daylight Sensor with Infrared Receiver

This daylight sensor is designed specifically to work with Lutron's ballasts, control modules, and sensor interfaces to implement daylight harvesting. It allows the control system to automatically dim the lights when the available daylight is high and brighten the lights when the available daylight is low in order to maintain a specific light level in the space. An integrated IR receiver resides within the sensor to allow access to the system for advanced programming and personal control.



Features

- Photopic response matches human eye.
- Mounts easily on any ceiling tile or fixture with 10 mm (3/8 in) diameter hole.
- Threaded mounting stud (may be shortened for applications with limited fixture height).
- Calibrated for daylight sensitivity through the Lighting Control System to which it is attached.
- Receives IR signals and transfers them to a digital ballast, control module, or sensor interface.
- The Infrared Receiver receives IR programming signals from up to 2.5 m (8.2 ft) away.
- Constructed of flame retardant material.
- Meets IEC 801-2. Tested to withstand 15 kV electrostatic discharge without damage.
- LED indicates programming mode.
- Sensor wire insulation is rated to 600 V, suitable for fixture installation.

LUTRON® SPECIFICATION SUBMITTAL Page 1

Job Name:	Model Numbers:	
Job Number:		

Specifications

Standards

- Designed for low-voltage PELV operation only. Voltages do not exceed 35 V⎓.
- Designed to give a linear response to changes in viewed light level
- For use with Lutron products only

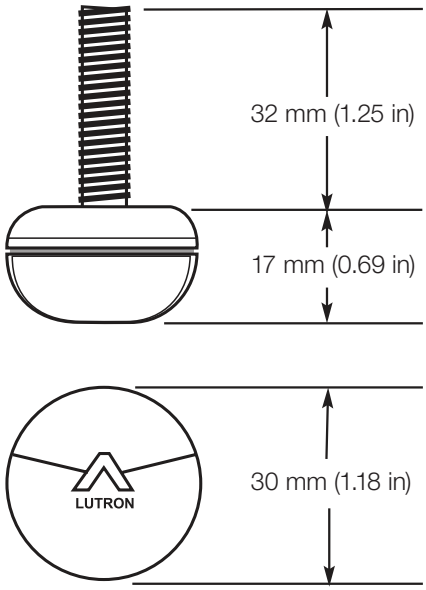
Power

- Operating Voltage: Low-voltage PELV, 20 V⎓
- Analog Signal: 0-2 mA
- IR Output: 0-20 V⎓

Environment

- Temperature: 0-45 °C (32-113 °F)
- Relative humidity: less than 90% non-condensing

Dimensions

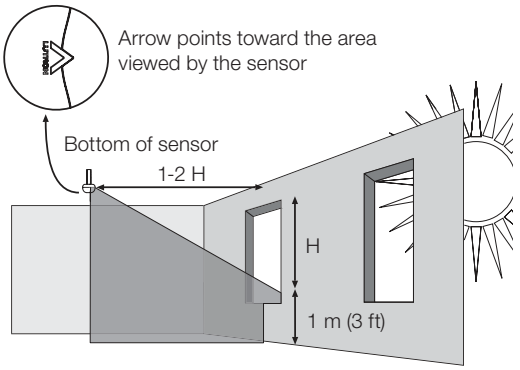


- Sensor lead length = 100 mm (4 in) minimum beyond threaded stud.
- Total wire length from sensor to device must not exceed 30 m (100 ft).
- Threaded Stud Diameter = 9.5 mm (3/8 in) maximum.
- Use 3/8 - 16 nut (provided) for mounting.

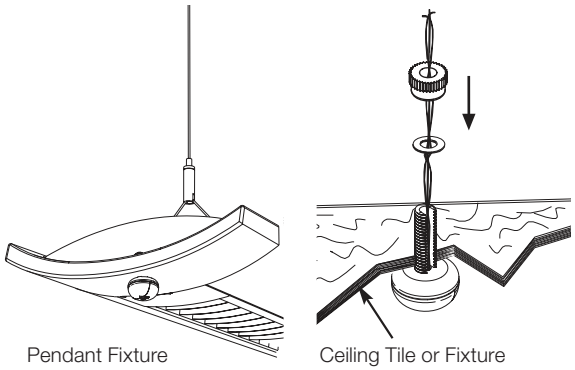
LUTRON® SPECIFICATION SUBMITTAL Page 2

Job Name:	Model Numbers:	
Job Number:		

Mounting and Wiring

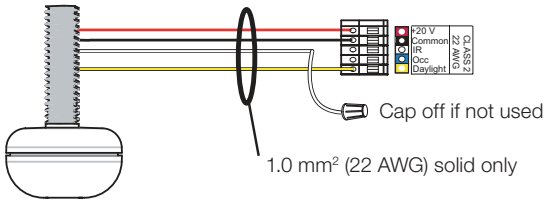


H = Effective Window Height



Pendant Fixture

Ceiling Tile or Fixture



Daylight Sensor with IR Receiver

Installation

Determine the proper location of the Daylight Sensor using the adjacent diagram.

- The arrow on the Daylight Sensor points toward the area viewed by the sensor
- The effective window height (H) starts 1 m (3 ft) up from the floor or at the window sill, whichever is higher, and ends at the top of the window.
- Place the daylight sensor so its viewing area is centered upon the nearest window at a distance of between 1-2 H from the window
- Ensure that the view of the Daylight Sensor is not obstructed
- Do not position the Daylight Sensor in the well of a skylight or above indirect lighting fixtures

Mounting the Daylight Sensor

- Drill a 10 mm (3/8 in) diameter hole in the ceiling tile or pendant fixture
- Thread the wires through the hole
- Install the Daylight Sensor into the hole
- Secure the Daylight Sensor with the mounting hardware provided (hand tighten only).

  Note - If the stem of the Daylight Sensor must be shortened due to its location (for instance, in a pendant fixture) this should be done prior to wiring.

Wiring to a Sensor Input

- Connect the sensor wires as described:

Wire	Terminal
Red	20 V⎓
Black	Common
Yellow	Daylight
White	IR Signal (cap off if not used)

- Make sure that the supply breaker to the control system is OFF
- Use only 1.0 mm² (22 AWG) solid wire
- If IR output is not required, the white wire should be terminated
- A sensor can only be wired to a single control module or sensor interface
- Each input on a control module or sensor interface can have only one daylight sensor connected to it

LUTRON® SPECIFICATION SUBMITTAL Page 3

Job Name:	Model Numbers:	
Job Number:		

Appendix D | Electrical Specifications

Product Description

- 480Y/277 Vac maximum (125 Vdc).
- 3-phase 4-wire, 3-phase 3-wire, 1-phase 3-wire, 1-phase 2-wire.
- 400 ampere maximum mains.
- 100 ampere maximum branch breakers.
- Bolt-on branch breakers.
- Factory assembled.
- Refer to **Page 14-5** for additional Information.

Type PRL2a

Application Description

- Lighting and appliance branch panelboard.
- Fully rated or series rated.
- Interrupting ratings up to 200 kA symmetrical.
- Suitable for use as Service Entrance Equipment, when specified on the order.
- See **Pages 14-5** through **14-18** for additional information.

Standards and Certifications

- UL 67, UL 50.
- Federal Specification W-P-115c.
- Refer to **Page 14-5** for additional information.

Options and Accessories

- Refer to **Page 14-46**.

Layout and Sizing

- Refer to **Page 14-24**.

Product Selection

Formula Pricing: Base Price + Branch Circuits + Modifications = Total Price U.S. $

Table 14-22. Base Prices — PRL2a

Ampere Rating	Interrupting Rating (kA Symmetrical)			Breaker Type	Price U.S. $		
	240 Vac	480Y/277 Vac	125/250 Vdc		3-Phase 4-Wire	1-Phase 3-Wire ①, 1-Phase 2-Wire	3-Phase 3-Wire ①
Main Lug Only							
100	—	—	—	—			
225	—	—	—	—			
400	—	—	—	—			
Main Breaker							
100	65	14	14	GHB			
100	18	14	10	EHD			
100	65	35	10	FD			
100	100	65	22	HFD			
100	200	100	22	FDC			
225	65	—	—	ED			
225	65	35	10	FD			
225	100	65	22	HFD			
225	200	100	22	FDC			
250	65	35	10	JD			
250	100	65	22	HJD			
250	200	100	22	JDC			
400	65	35	10	KD			
400	100	65	22	HKD			
400	200	100	22	KDC			

① These system voltages apply only to 240 volts.

Table 14-23. Branch Circuit Breakers — PRL2a

Ampere Rating	Interrupting Rating (kA Symmetrical)			Breaker Type	Price U.S. $		
	240 Vac ②	480Y/277 Vac	125/250 Vdc		1-Pole	2-Pole	3-Pole
15 – 20	65	14	—	GHQ ③			
15 – 20	65	14	14	GHB ③			
25 – 60	65	14	14	GHB ③			
70 – 100	65	14	14	GHB ③			
15 – 30	65	25	—	HGHB ③			
15 – 20	65	14	—	GHQRSP ④			
15 – 30	65	14	—	GHBS ③④			
15 – 60	—	14	—	GHBGFEP ③⑤			
15 – 20	—	14	—	GHBHID ③⑥			
Provision	—	—	—	—			

② Interrupting ratings in this column are applicable to 120 Vac for 1-pole breakers.
③ At 480 volts, must be used on 480Y/277 volts grounded wye systems only.
④ Solenoid operated breaker.
⑤ GFP for 30 mA equipment protection. Requires 2-pole spaces. 277 Vac only.
⑥ HID (High Intensity Discharge) rated breaker.

14

Discount Symbol **CE9**

Box Sizing and Selection

Assembled Circuit Breaker Panelboards

Box size and box and trim catalog numbers for all standard panelboard types are found in **Table 14-24**.

Instructions

1. Using description of the required panelboard, select the rating and type of main required.
2. Count the total number of branch circuit poles, including provisions, required in the panelboard. Do not count main breaker poles. Convert 2- or 3-pole branch breaker to single-poles, i.e., 3-pole breaker, count as 3 poles.

   Determine sub-feed breaker or through-feed lug requirements.
3. Select the main ampere rating section from **Table 14-24**.
4. Select panelboard type from first column, main breaker frame, if applicable, from second column, and sub-feed breaker frame, if applicable, from the third column.
5. From Step #2, determine the number of branch circuits in Column 4.
6. Read box size, box and trim catalog numbers across columns to the right. Specify surface or flush mounting on the order.

Cabinets

Fronts are code-gauge steel, ANSI-61 light gray painted finish.

Boxes are code-gauge galvanized steel without knockouts. Standard depth is 5-3/4 inches (146.1 mm). Standard width is 20 inches (508.0 mm). An optional 28-inch (711.2 mm) wide box is available.

Top and Bottom Gutters

5-1/2 inches (139.7 mm) minimum.

Table 14-24. PRL2a Panelboard Sizing

Panelboard Types	Main Breaker Types & Mounting Position (H) = Horiz. (V) = Vert.	Sub-Feed Breaker Types & Mounting Position (H) = Horiz. (V) = Vert.	Maximum No. of Branch Circuits Including Provisions	Box Dimensions Inches ①②			YS Box Catalog Number	LT Trim Catalog Number	EZ Box Catalog Number	EZ Trim Catalog Number
				H	W	D				
100 Ampere Maximum										
Main Breaker	BAB, QBHW	—	15	36.00	20.00	5.75	**YS2036**	**LT2036S or F**	**EZB2036R**	**EZT2036S or F**
	(H)	—	27	48.00	20.00	5.75	**YS2048**	**LT2048S or F**	**EZB2048R**	**EZT2048S or F**
		—	39	48.00	20.00	5.75	**YS2048**	**LT2048S or F**	**EZB2048R**	**EZT2048S or F**
		—	42	60.00	20.00	5.75	**YS2060**	**LT2060S or F**	**EZB2060R**	**EZT2060S or F**
Main Lugs or Main Breaker	EHD	—	18	36.00	20.00	5.75	**YS2036**	**LT2036S or F**	**EZB2036R**	**EZT2036S or F**
	FD, HFD	—	30	48.00	20.00	5.75	**YS2048**	**LT2048S or F**	**EZB2048R**	**EZT2048S or F**
	(V)	—	42	48.00	20.00	5.75	**YS2048**	**LT2048S or F**	**EZB2048R**	**EZT2048S or F**
Main Lugs or Main Breaker with 100 A Thru-Feed Lugs or Sub- Feed Breaker	EHD	EHD	18	48.00	20.00	5.75	**YS2048**	**LT2048S or F**	**EZB2048R**	**EZT2048S or F**
	FD	FD	30	48.00	20.00	5.75	**YS2048**	**LT2048S or F**	**EZB2048R**	**EZT2048S or F**
	HFD	HFD	42	60.00	20.00	5.75	**YS2060**	**LT2060S or F**	**EZB2060R**	**EZT2060S or F**
	(V)	(V)								
225 Ampere Maximum										
Main Lugs or Main Breaker	EDB, EDS, ED,	—	18	36.00	20.00	5.75	**YS2036**	**LT2036S or F**	**EZB2036R**	**EZT2036S or F**
	EDH, FD, HFD	—	30	48.00	20.00	5.75	**YS2048**	**LT2048S or F**	**EZB2048R**	**EZT2048S or F**
	(V)	—	42	48.00	20.00	5.75	**YS2048**	**LT2048S or F**	**EZB2048R**	**EZT2048S or F**
	JD, HJD	—	18	60.00	20.00	5.75	**YS2060**	**LT2060S or F**	**EZB2060R**	**EZT2060S or F**
	JDC	—	30	60.00	20.00	5.75	**YS2060**	**LT2060S or F**	**EZB2060R**	**EZT2060S or F**
	(V)	—	42	72.00	20.00	5.75	**YS2072**	**LT2072S or F**	**EZB2072R**	**EZT2072S or F**
Main Lugs or Main Breaker with 225 A Thru-Feed Lugs or Sub-Feed Breaker	EHD, FD, HFD,	EHD, FD, HFD,	18	48.00	20.00	5.75	**YS2048**	**LT2048S or F**	**EZB2048R**	**EZT2048S or F**
	EDB, EDS, ED,	EDB, EDS, ED,	30	48.00	20.00	5.75	**YS2048**	**LT2048S or F**	**EZB2048R**	**EZT2048S or F**
	EDH (V)	EDH (V)	42	60.00	20.00	5.75	**YS2060**	**LT2060S or F**	**EZB2060R**	**EZT2060S or F**
	JD, HJD	EHD, FD, HFD,	18	60.00	20.00	5.75	**YS2060**	**LT2060S or F**	**EZB2060R**	**EZT2060S or F**
	JDC	EDB, EDS, ED,	30	72.00	20.00	5.75	**YS2072**	**LT2072S or F**	**EZB2072R**	**EZT2072S or F**
	(V)	EDH (V)	42	72.00	20.00	5.75	**YS2072**	**LT2072S or F**	**EZB2072R**	**EZT2072S or F**
400 Ampere Maximum										
Main Lugs or Main Breaker	DK, KD, HKD,	—	18	60.00	20.00	5.75	**YS2060**	**LT2060S or F**	**EZB2060R**	**EZT2060S or F**
	KDC	—	30	60.00	20.00	5.75	**YS2060**	**LT2060S or F**	**EZB2060R**	**EZT2060S or F**
	(V)	—	42	72.00	20.00	5.75	**YS2072**	**LT2072S or F**	**EZB2072R**	**EZT2072S or F**
Main Lugs or Main Breaker with 225 A Thru-Feed Lugs or Sub- Feed Breaker	DK, KD, HKD,	EHD, FD, HFD,	18	60.00	20.00	5.75	**YS2060**	**LT2060S or F**	**EZB2060R**	**EZT2060S or F**
	KDC	EDB, EDS, ED,	30	72.00	20.00	5.75	**YS2072**	**LT2072S or F**	**EZB2072R**	**EZT2072S or F**
	(V)	EDH (V)	42	72.00	20.00	5.75	**YS2072**	**LT2072S or F**	**EZB2072R**	**EZT2072S or F**
Main Lugs or Main Breaker with 400 A Thru-Feed Lugs or Sub- Feed Breaker	DK, KD, HKD,	JD, HJD, JDC,	18	72.00	20.00	5.75	**YS2072**	**LT2072S or F**	**EZB2072R**	**EZT2072S or F**
	KDC	DK, KD,	30	90.00	20.00	5.75	**YS2090**	**LT2090S or F**	**EZB2090R**	**EZT2090S or F**
	(V)	HKD, KDC	42	90.00	20.00	5.75	**YS2090**	**LT2090S or F**	**EZB2090R**	**EZT2090S or F**
		(V)								

① Metric box dimensions:

Catalog Number		Dimensions in mm		
YS Box	EZ Box	Height	Width	Depth
YS2036	**EZB2036R**	914.4	508.0	146.1
YS2048	**EZB2048R**	1219.2	508.0	146.1
YS2060	**EZB2060R**	1524.0	508.0	146.1
YS2072	**EZB2072R**	1828.8	508.0	146.1
YS2090	**EZB2090R**	2286.0	508.0	146.1

② Smaller panelboard box sizes are available if required. Contact Eaton for application information.

Model: 350REOZVC

KOHLER POWER SYSTEMS 190-600 V Diesel

ISO 9001 KOHLER POWER SYSTEMS NATIONALLY REGISTERED

Ratings Range

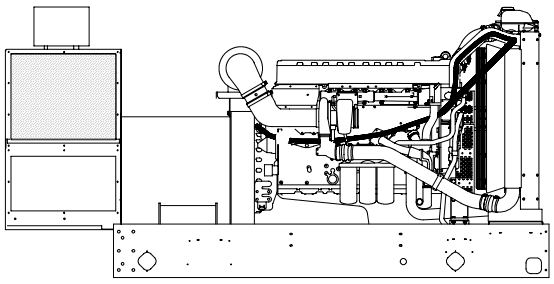
		60 Hz	50 Hz
Standby:	**kW**	305-360	288-328
	kVA	381-450	360-410
Prime:	**kW**	275-330	260-296
	kVA	344-413	325-370

Generator Set Ratings

				Standby Rating		Prime Rating	
				150°C Rise	130°C Rise	125°C Rise	105°C Rise
Alternator	**Voltage**	**Ph**	**Hz**	**kW/kVA**	**kW/kVA**	**kW/kVA**	**kW/kVA**
4M4019	120/208	3	60	355/444	350/438	325/406	320/400
	127/220	3	60	360/450	360/450	330/413	330/413
	139/240	3	60	360/450	360/450	330/413	330/413
	220/380	3	60	305/381	305/381	275/344	275/344
	240/416	3	60	355/444	350/438	325/406	320/400
	277/480	3	60	360/450	360/450	330/413	330/413
	110/190	3	50	324/405	300/375	292/365	272/340
	115/200	3	50	324/405	292/365	292/365	264/330
	120/208	3	50	312/390	288/360	284/355	260/325
	220/380	3	50	324/405	300/375	292/365	272/340
	230/400	3	50	324/405	292/365	292/365	264/330
	240/416	3	50	312/390	288/360	284/355	260/325
4M4021	120/208	3	60	360/450	360/450	330/413	330/413
	127/220	3	60	360/450	360/450	330/413	330/413
	139/240	3	60	360/450	360/450	330/413	330/413
	220/380	3	60	315/394	315/394	285/356	285/356
	240/416	3	60	360/450	360/450	330/413	330/413
	277/480	3	60	360/450	360/450	330/413	330/413
	110/190	3	50	328/410	320/400	296/370	288/360
	115/200	3	50	328/410	324/405	296/370	292/365
	120/208	3	50	328/410	320/400	296/370	288/360
	220/380	3	50	328/410	320/400	296/370	288/360
	230/400	3	50	328/410	324/405	296/370	292/365
	240/416	3	50	328/410	320/400	296/370	288/360
5M4027	120/208	3	60	360/450	360/450	330/413	330/413
	127/220	3	60	360/450	360/450	330/413	330/413
	139/240	3	60	360/450	360/450	330/413	330/413
	220/380	3	60	360/450	360/450	330/413	330/413
	240/416	3	60	360/450	360/450	330/413	330/413
	277/480	3	60	360/450	360/450	330/413	330/413
	110/190	3	50	328/410	328/410	296/370	296/370
	115/200	3	50	328/410	328/410	296/370	296/370
	120/208	3	50	328/410	328/410	296/370	296/370
	220/380	3	50	328/410	328/410	296/370	296/370
	230/400	3	50	328/410	328/410	296/370	296/370
	240/416	3	50	328/410	328/410	296/370	296/370
4M4158	220/380	3	60	360/450	360/450	330/413	330/413
5M4162	220/380	3	60	360/450	360/450	330/413	330/413
4M4266	347/600	3	60	360/450	360/450	330/413	330/413
5M4272	347/600	3	60	360/450	360/450	330/413	330/413

Standard Features

- Kohler Co. provides one-source responsibility for the generating system and accessories.
- The generator set and its components are prototype-tested, factory-built, and production-tested.
- The 60 Hz generator set offers a UL 2200 listing.
- The generator set accepts rated load in one step.
- The generator set complies with ISO 8528-5, Class G3, requirements for transient performance.
- A one-year limited warranty covers all systems and components. Two-, five-, and ten-year extended warranties are also available.
- Alternator features:
  - The pilot-excited, permanent-magnet (PM) alternator provides superior short-circuit capability.
  - The brushless, rotating-field alternator has broadrange reconnectability.
- Other features:
  - Controllers are available for all applications. See controller features inside.
  - The low coolant level shutdown prevents overheating (standard on radiator models only).
  - Integral vibration isolation eliminates the need for under-unit vibration spring isolators.
  - An electronic, isochronous governor delivers precise frequency regulation.
  - Electronic engine controls and a generator microprocessor controller combine to deliver one of the most advanced control systems in today's generator set market.



RATINGS: All three-phase units are rated at 0.8 power factor. *Standby Ratings:* Standby ratings apply to installations served by a reliable utility source. The standby rating is applicable to varying loads for the duration of a power outage. There is no overload capability for this rating. Ratings are in accordance with ISO-3046/1, BS 5514, AS 2789, and DIN 6271. *Prime Power Ratings:* Prime power ratings apply to installations where utility power is unavailable or unreliable. At varying load, the number of generator set operating hours is unlimited. A 10% overload capacity is available for one hour in twelve. Ratings are in accordance with ISO-8528/1, overload power in accordance with ISO-3046/1, BS 5514, AS 2789, and DIN 6271. For limited running time and base load ratings, consult the factory. Obtain the technical information bulletin (TIB-101) on ratings guidelines for the complete ratings definitions. The generator set manufacturer reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever. GENERAL GUIDELINES FOR DERATION: *Altitude:* Derate 0.8% per 100 m (328 ft.) elevation above 1000 m (3280 ft.). *Temperature:* Derate 5.0% per 10°C (18°F) temperature above 40°C (104°F). For radiator cooling system capacity, derate 0.5°C (0.9°F) per 100 m (328 ft.) elevation above 150 m (492 ft.).

G5-287 (350REOZVC) 3/06b

Alternator Specifications

Specifications		Alternator
Type		4-Pole, Rotating-Field
Exciter type		Brushless, Permanent-Magnet
Leads: quantity, type		12, Reconnectable
Voltage regulator		Solid State, Volts/Hz
Insulation:		NEMA MG1
Material		Class H
Temperature rise		130°C, Standby
Bearing: quantity, type		1, Sealed
Coupling		Flexible Disc
Amortisseur windings		Full
Voltage regulation, no-load to full-load (with < 0.5% drift due to temp. variation)		3-Phase Sensing, 0.25%
One-step load acceptance		100% of Rating
Unbalanced load capability		100% of Rated Standby Current
Peak motor starting kVA:		(35% dip for voltages below)
480 V, 380 V	4M4019 (12 lead)	1325 (60Hz), 865 (50Hz)
480 V, 380 V	4M4021 (12 lead)	1350 (60Hz), 825 (50Hz)
480 V, 380 V	5M4027 (12 lead)	1550 (60Hz), 1100 (50Hz)
380 V	4M4158 (4 lead)	1000 (60Hz)
380 V	5M4162 (4 lead)	2100 (60Hz)
600 V	4M4266 (4 lead)	1300 (60Hz)
600 V	5M4272 (4 lead)	1750 (60Hz)

- NEMA MG1, IEEE, and ANSI standards compliance for temperature rise and motor starting.
- Sustained short-circuit current of up to 300% of the rated current for up to 10 seconds.
- Sustained short-circuit current enabling downstream circuit breakers to trip without collapsing the alternator field.
- Self-ventilated and dripproof construction.
- Superior voltage waveform from a two-thirds pitch stator and skewed rotor.
- Digital solid-state, volts-per-hertz voltage regulator with ±0.25% no-load to full-load regulation.
- Brushless alternator with brushless pilot exciter for excellent load response.

Application Data

Engine

Engine Specifications	60 Hz	50 Hz
Engine model	D350 12.1A65	
Engine type	4-Cycle, Turbocharged, Charge Air Cooled	
Cylinder arrangement	6, Inline	
Displacement, L (cu. in.)	12.13 (740)	
Bore and stroke, mm (in.)	131 x 150 (5.16 x 5.91)	
Compression ratio	17.5:1	
Piston speed, m/min. (ft./min.)	540 (1772)	450 (1476)
Main bearings: quantity, type	7, Precision Half-Shell	
Rated rpm	1800	1500
Max. power at rated rpm, kWm (BHP)	402 (539)	363 (486)
Cylinder head material	Cast Iron	
Piston: type, material	Swirl Chamber, Graphite-Coated Aluminum	
Crankshaft material	Forged Steel	
Valve material	Nimonic	
Governor: type, make/model	EDC III	
Frequency regulation, no-load to full-load	Isochronous	
Frequency regulation, steady state	±0.25%	
Frequency	Field-Convertible	
Air cleaner type, all models	Dry	

Exhaust

Exhaust System	60 Hz	50 Hz
Exhaust flow at rated kW, m^3/min. (cfm)	71.9 (2540)	62.9 (2220)
Exhaust temperature at rated kW, dry exhaust, °C (°F)	495 (923)	505 (941)
Maximum allowable back pressure, kPa (in. Hg)	10.2 (3.0)	
Engine exhaust outlet size, mm (in.)	See ADV Drawing	

Engine Electrical

Engine Electrical System	60 Hz	50 Hz
Battery charging alternator:		
Ground (negative/positive)	Negative	
Volts (DC)	24	
Ampere rating	60	
Starter motor rated voltage (DC)	24	
Battery, recommended cold cranking amps (CCA):		
Qty., CCA rating each	Two, 950	
Battery voltage (DC)	12	

Fuel

Fuel System	60 Hz	50 Hz
Fuel supply line, min. ID, mm (in.)	10 (0.39)	
Fuel return line, min. ID, mm (in.)	10 (0.39)	
Max. lift, engine-driven fuel pump, m (ft.)	2.0 (6.6)	
Max. fuel flow, Lph (gph)	550 (145.3)	500 (132.1)
Fuel prime pump	Manual	
Fuel filter: quantity, type	2, Primary, 30 Microns/ Secondary w/Water Separator, 5 Microns	
Recommended fuel	#2 Diesel	

Lubrication

Lubricating System	60 Hz	50 Hz
Type	Full Pressure	
Oil pan capacity, L (qt.)	31 (33)	
Oil pan capacity with filter, L (qt.)	35 (37)	
Oil filter: quantity, type	3, Cartridge	
Oil cooler	Water-Cooled	

Application Data

Cooling

Radiator System	60 Hz	50 Hz
Ambient temperature, °C (°F)*	50 (122)	
Engine jacket water capacity, L (gal.)	20 (5.28)	
Radiator system capacity, including engine, L (gal.)	44.0 (11.62)	
Engine jacket water flow, Lpm (gpm)	360 (95)	288 (76)
Heat rejected to cooling water at rated kW, dry exhaust, kW (Btu/min.)	148 (8420)	132 (7500)
Heat rejected to charge air cooler at rated kW, dry exhaust, kW (Btu/min.)	84 (4780)	73 (4140)
Water pump type	Centrifugal	
Fan diameter, including blades, mm (in.)	890 (35)	
Fan, kWm (HP)	15 (20)	9 (12)
Max. restriction of cooling air, intake and discharge side of radiator, kPa (in. H_2O)	0.125 (0.5)	

* Weather and sound enclosures with internal silencer and weather housing with external silencer reduce ambient temperature capability by 5°C (9°F).

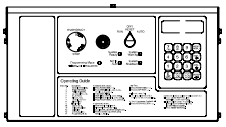
Operation Requirements

Air Requirements	60 Hz	50 Hz
Radiator-cooled cooling air, m^3/min. (scfm)†	468 (16530)	385 (13600)
Combustion air, m^3/min. (cfm)	29 (1030)	25 (880)
Heat rejected to ambient air:		
Engine, kW (Btu/min.)	75.6 (4300)	72.8 (4140)
Alternator, kW (Btu/min.)	22.7 (1290)	24.8 (1410)

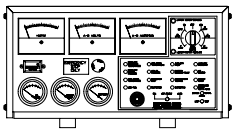
† Air density = 1.20 kg/m^3 (0.075 lbm/$ft^{3)}$

Fuel Consumption	60 Hz	50 Hz
Diesel, Lph (gph) at % load	**Standby Rating**	
100%	93.6 (24.7)	84.7 (22.4)
75%	70.0 (18.5)	62.7 (16.6)
50%	48.4 (12.8)	42.8 (11.3)
25%	28.3 (7.5)	24.3 (6.4)
Diesel, Lph (gph) at % load	**Prime Rating**	
100%	85.6 (22.6)	76.1 (20.1)
75%	64.4 (17.0)	56.8 (15.0)
50%	44.7 (11.8)	39.4 (10.4)
25%	26.9 (7.1)	22.4 (5.9)

Controllers



Decision-Maker™ 550 Controller
Audiovisual annunciation with NFPA 110 Level 1 capability.
Programmable microprocessor logic and digital display features.
Alternator safeguard circuit protection.
12- or 24-volt engine electrical system capability.
Remote start, remote annunciation, and remote communication options.
Refer to G6-46 for additional controller features and accessories.



Decision-Maker™ 3+, 16-Light Controller
Audiovisual annunciation with NFPA 110 Level 1 capability.
Microprocessor logic, AC meters, and engine gauge features.
12- or 24-volt engine electrical system capability.
Remote start, prime power, and remote annunciation options.
Refer to G6-30 for additional controller features and accessories.

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KohlerPowerSystems.com

Kohler Power Systems
Asia Pacific Headquarters
7 Jurong Pier Road
Singapore 619159
Phone (65) 6264-6422, Fax (65) 6264-6455

Standard Features

- Alternator Protection (standard with 550 controller)
- Battery Rack and Cables
- Electronic, Isochronous Governor
- Oil Drain Extension
- Operation and Installation Literature

Available Accessories

Enclosed Unit

❑ Sound Enclosure and Subbase Fuel Tank Packages
❑ Weather Enclosure and Subbase Fuel Tank Packages
❑ Weather Housing (with skid end caps and roof-mounted silencer)

Open Unit

❑ Exhaust Silencer, Hospital (kits: PA-354903, PA-354905)
❑ Exhaust Silencer, Critical (kits: PA-354880, PA-354881)
❑ Flexible Exhaust Connector, Stainless Steel

Cooling System

❑ Block Heater; recommended for ambient temperatures below 4°C (40°F)
❑ Radiator Duct Flange

Fuel System

❑ Flexible Fuel Lines
❑ Fuel Pressure Gauge
❑ Subbase Fuel Tanks
❑ Subbase Fuel Tank with Day Tank

Electrical System

❑ Battery
❑ Battery Charger, Equalize/Float Type
❑ Battery Heater

Engine and Alternator

❑ Air Cleaner, Heavy Duty
❑ Air Cleaner Restriction Indicator
❑ Alternator Strip Heater
❑ Bus Bar Kits
❑ Crankcase Emission Canister
❑ CSA Certification
❑ Hand Prime Pump
❑ Line Circuit Breaker (NEMA1 enclosure)
❑ Line Circuit Breaker with Shunt Trip (NEMA1 enclosure)
❑ Rated Power Factor Testing
❑ Rodent Guards
❑ Safeguard Breaker (not available with 550 controller)
❑ Skid End Caps

Paralleling System

❑ Load-Sharing Module
❑ Reactive Droop Compensator
❑ Remote Speed Adjusting Control
❑ Remote Voltage Adjustment Control
❑ Voltage Regulator Relocation Kit

Maintenance and Literature

❑ General Maintenance Literature Kit
❑ Maintenance Kit (includes air, oil, and fuel filters)
❑ NFPA 110 Literature
❑ Overhaul Literature Kit
❑ Production Literature Kit

Controller

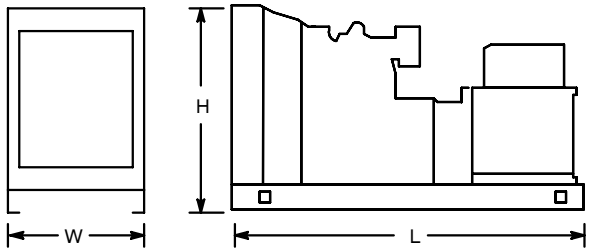
❑ Common Failure Relay Kit
❑ Communications Products and PC Software (550 controller only)
❑ Customer Connection Kit
❑ Dry Contact Kit (isolated alarm)
❑ Engine Prealarm Sender Kit
❑ Prime Power Switch Kit (550 controller only)
❑ Remote Annunciator Panel
❑ Remote Audiovisual Alarm Panel
❑ Remote Emergency Stop Kit
❑ Remote Mounting Cable
❑ Run Relay Kit

Miscellaneous Accessories

❑ _____
❑ _____
❑ _____
❑ _____
❑ _____
❑ _____
❑ _____
❑ _____

Dimensions and Weights

Overall Size, L x W x H, mm (in.):	3336 x 1325 x 1763 (131.4 x 52.2 x 69.4)
Weight (radiator model), wet, kg (lb.):	3175 (7000)



NOTE: This drawing is provided for reference only and should not be used for planning installation. Contact your local distributor for more detailed information.

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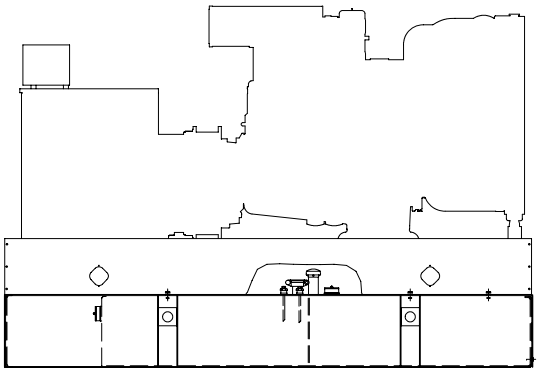
G5-287 (350REOZVC) 3/06b

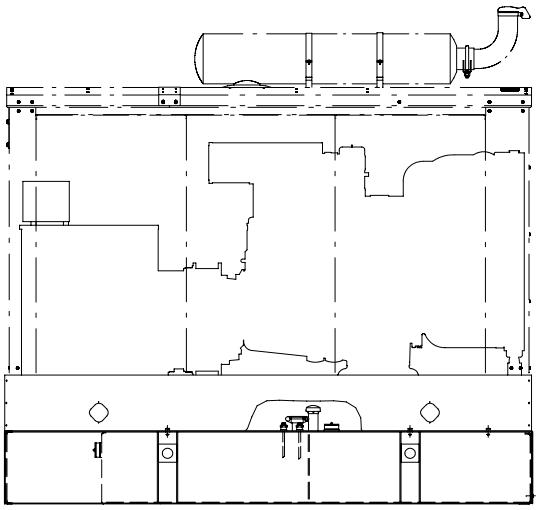
KOHLER POWER SYSTEMS

Subbase Diesel Fuel Tank

ISO 9001 KOHLER POWER SYSTEMS NATIONALLY REGISTERED



Subbase Tank



Subbase Tank with Optional Weather Housing

Double-Wall Subbase Fuel Tank (UL Listed)

Applicable to the following:

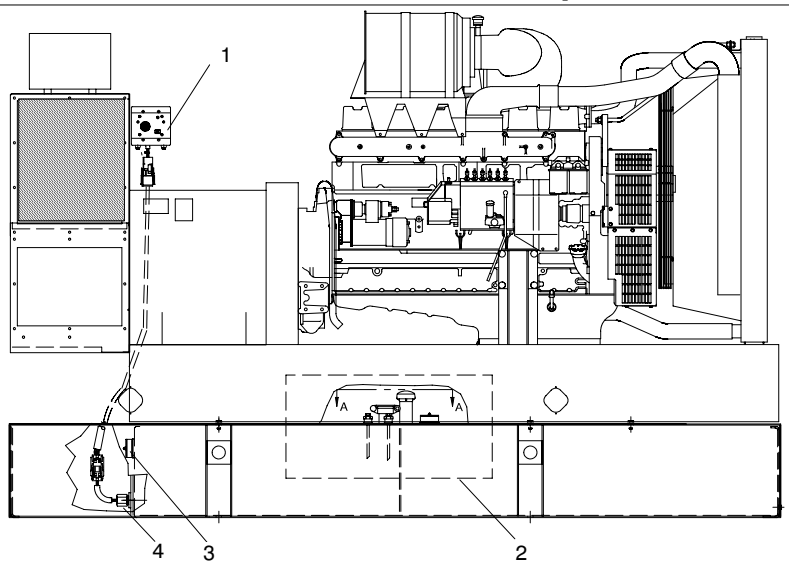
275–500REOZV
350/400REOZVC
450/500REOZVB

Secondary Containment (SC) Tank

- The above-ground rectangular secondary containment tank mounts directly to the generator set, below the generator set skid (subbase).
- Both the inner and outer UL-listed tanks have emergency relief vents.
- The containment tank's double-wall construction protects against fuel leaks and ruptures. The inner (primary) tank is sealed inside the outer (secondary) tank. The outer tank contains the fuel if the inner tank leaks or ruptures.
- The subbase fuel tank is compatible with a weather housing.

G6-64 11/05e

Fuel Tank Features and Options



1. Inner tank leak alarm kit
2. Fuel tank fittings and components (see Figure 2 or Figure 3 for details)
3. Emergency pressure relief vent inner tank (same NPT size as item 6 in Figure 2 or item 5 in Figure 3)
4. 1/2 in. NPT for leak detection switch

Figure 1 Double-Wall Subbase Fuel Tanks (Secondary Containment)

1. 2 in. NPT for overflow to main tank, 7.6 L (2 gpm) pump maximum, (1 in. NPT reducer bushing)
2. 2 in. NPT for fuel inlet from supply pump (1 in. NPT reducer bushing)
3. 2 in. NPT for additional accessory (sensor/pump control float switch)
4. 2 in. NPT for removable engine supply diptube (3/8 in. female NPT with check valve)
5. 2 in. NPT for removable fuel return diptube (3/8 in. female NPT)
6. Emergency pressure relief vent inner tank per NFPA 30
   3 in. NPT 719-1020 L (190-270 gal.)
   4 in. NPT 1400-2271 L (370-600 gal.)
   5 in. NPT 2953-5678 L (780-1500 gal.)
   6 in. NPT 6738-10183 L (1780-2690 gal.)
7. 2 in. NPT normal vent with 127 mm (5 in.) riser and mushroom cap
8. 2 in. NPT raised manual fill cap with 51 mm (2 in.) riser
9. 2 in. NPT mechanical fuel level gauge
10. 2 in. NPT for low fuel level switch (set to activate at less than 50% full)

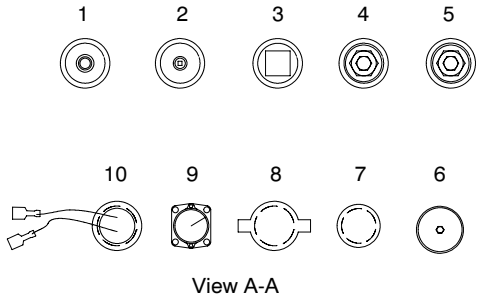


Figure 2 275-500REOZV and 350/400REOZVC Fuel Tank Fittings Top View (Figure 1, View A-A, Right Side of Generator Set)

1. 2 in. NPT for low fuel level switch (set to activate at less than 50% full)
2. 2 in. NPT mechanical fuel level gauge
3. 2 in. NPT raised manual fill cap with 51 mm (2 in.) riser
4. 2 in. NPT normal vent with 127 mm (5 in.) riser and mushroom cap
5. Emergency pressure relief vent inner tank per NFPA 30
   3 in. NPT 719-1020 L (190-270 gal.)
   4 in. NPT 1400-2271 L (370-600 gal.)
   5 in. NPT 2953-5678 L (780-1500 gal.)
   6 in. NPT 6738-10183 L (1780-2690 gal.)
6. 2 in. NPT for removable fuel return diptube (3/8 in. female NPT)
7. 2 in. NPT for removable engine supply diptube (3/8 in. female NPT with check valve)
8. 2 in. NPT for additional accessory (sensor/pump control float switch)
9. 2 in. NPT for fuel inlet from supply pump (1 in. NPT reducer bushing)
10. 2 in. NPT for overflow to main tank, 7.6 L (2 gpm) pump maximum, (1 in. NPT reducer bushing)

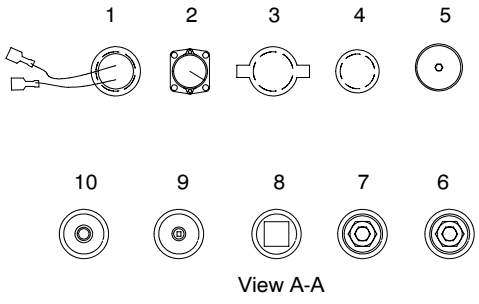


Figure 3 450/500REOZVB Fuel Tank Fittings Top View (Figure 1, View A-A, Left Side of Generator Set)

Fuel Tank Weights and Dimensions

Kit No.	Capacity, L (gal.)	Length, mm (in.)	Width, mm (in.)	Height, mm (in.)	Weight, kg (lb.)	Est. Fuel Supply, Hours at 60 Hz with Full Load
275REOZV						
GM31196-KP2/KA2	1020 (270)	3300 (129.92)	1250 (49.21)	457 (18.00)	617 (1360)	12
GM31196-KP5/KA5	1893 (500)			762 (30.00)	823 (1815)	24
GM31196-KP7/TP7	2953 (780)	4064 (160.00)		914 (36.00)	1098 (2420)	36
GM31196-KP9/TP9	3785 (1000)	3810 (150.00)	1676 (66.00)		1408 (3105)	48
GM31196-KP12/TP12	5678 (1500)	4978 (196.00)	1829 (72.00)		2295 (5060)	72
300REOZV						
GM31196-KP2/KA2	1020 (270)	3300 (129.92)	1250 (49.21)	457 (18.00)	617 (1360)	12
GM31196-KP6/TP6	2271 (600)			914 (36.00)	921 (2030)	24
GM31196-KP7/TP7	2953 (780)	4064 (160.00)			1098 (2420)	36
GM31196-KP10/TP10	4543 (1200)	4369 (172.00)	1676 (66.00)		1563 (3445)	48
GM31196-KP13/TP13	6738 (1780)	5690 (224.00)	1829 (72.00)		2552 (5625)	72
350REOZV						
GM31196-KP3/KA3	1400 (370)	3300 (129.92)	1250 (49.21)	610 (24.00)	714 (1575)	12
GM31196-KP6/TP6	2271 (600)			914 (36.00)	921 (2030)	24
GM31196-KP9/TP9	3785 (1000)	3810 (150.00)	1676 (66.00)		1408 (3105)	36
GM31196-KP10/TP10	4543 (1200)	4369 (172.00)			1563 (3445)	48
GM31196-KP13/TP13	6738 (1780)	5690 (224.00)	1829 (72.00)		2552 (5625)	72
350REOZVC						
GM31196-KP17/-KA17	1514 (400)	3680 (144.88)	1325 (52.16)	610 (24.0)	830 (1830)	12
GM31196-KP18/-TP18	2971 (785)	4040 (159.05)		914 (36.0)	1202 (2650)	24
GM31196-KP19/-TP19	4467 (1180)	4370 (172.04)	1829 (72.00)		1828 (4030)	36
GM31196-KP20/-TP20	5943 (1570)	5435 (213.97)			2259 (4980)	48
GM31196-KP21/-TP21	8896 (2350)	5815 (228.93)	2438 (95.98)		3007 (6630)	72
400REOZV						
GM31196-KP3/KA3	1400 (370)	3300 (129.92)	1250 (49.21)	610 (24.00)	714 (1575)	12
GM31196-KP7/TP7	2953 (780)	4064 (160.00)		914 (36.00)	1098 (2420)	24
GM31196-KP10/TP10	4543 (1200)	4369 (172.00)	1676 (66.00)		1563 (3445)	36
GM31196-KP12/TP12	5678 (1500)	4978 (196.00)	1829 (72.00)		2295 (5060)	48
GM31196-KP15/TP15	7987 (2110)	5690 (244.00)	2134 (84.00)		2926 (6450)	72
400REOZVC						
GM31196-KP17/-KA17	1514 (400)	3680 (144.88)	1325 (52.16)	610 (24.0)	830 (1830)	12
GM31196-KP18/-TP18	2971 (785)	4040 (159.05)		914 (36.0)	1202 (2650)	24
GM31196-KP19/-TP19	4467 (1180)	4370 (172.04)	1829 (72.00)		1828 (4030)	36
GM31196-KP20/-TP20	5943 (1570)	5435 (213.97)			2259 (4980)	48
GM31196-KP21/-TP21	8896 (2350)	5815 (228.93)	2438 (95.98)		3007 (6630)	72
450REOZVB						
GM38569-KP1/-TP1	1647 (435)	3900 (153.54)	1325 (52.17)	610 (24.00)	858 (1892)	12
GM38569-KP2/-TP2	3319 (875)	4700 (185.03)		914 (36.00)	1289 (2842)	24
GM38569-KP3/-TP3	5023 (1330)	5000 (196.85)	1800 (70.87)		1932 (4259)	36
GM38569-KP4/-TP4	6558 (1730)	5600 (220.47)	2000 (78.74)		2286 (5040)	48
GM38569-KP5/-TP5	9865 (2605)	6600 (259.84)	2400 (94.49)		2998 (6609)	72

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Asia Pacific Headquarters
7 Jurong Pier Road
Singapore 619159
Phone (65) 6264-6422, Fax (65) 6264-6455

Fuel Tank Weights and Dimensions, continued

Kit No.	Capacity, L (gal.)	Length, mm (in.)	Width, mm (in.)	Height, mm (in.)	Weight, kg (lb.)	Est. Fuel Supply, Hours at 60 Hz with Full Load
500REOZV						
GM31196-KP4/KA4	1703 (450)	4000 (157.48)	1325 (52.17)	610 (24.00)	857 (1890)	12
GM31196-KP8/TP8	3407 (900)	4660 (183.46)		914 (36.00)	1198 (2640)	24
GM31196-KP11/TP11	5110 (1350)	4910 (193.31)	1829 (72.00)		2102 (4635)	36
GM31196-KP14/TP14	6795 (1795)	6080 (239.37)			2572 (5670)	48
GM31196-KP16/TP16	10183 (2690)	6540 (257.48)	2438 (96.00)		3509 (7735)	72
500REOZVB						
GM38569-KP1/-TP1	1647 (435)	3900 (153.54)	1325 (52.17)	610 (24.00)	858 (1892)	12
GM38569-KP2/-TP2	3319 (875)	4700 (185.03)		914 (36.00)	1289 (2842)	24
GM38569-KP3/-TP3	5023 (1330)	5000 (196.85)	1800 (70.87)		1932 (4259)	36
GM38569-KP4/-TP4	6558 (1730)	5600 (220.47)	2000 (78.74)		2286 (5040)	48
GM38569-KP5/-TP5	9865 (2605)	6600 (259.84)	2400 (94.49)		2998 (6609)	72

Fuel Tank Features and Accessories

Standard Features

- Heavy-gauge construction
- Integral stub-up area
- Removable end channel for easy access to stub-up area
- UL listed
- Emergency pressure-relief vent outer tank
- Lockable fill cap and riser, 2 in. NPT
- Low fuel level switch for controller alarm
- Mechanical fuel gauge
- Normal vent with riser and mushroom cap
- Emergency pressure-relief vent inner tank
- Fuel supply and fuel return openings
- Basin drain
- Overflow opening
- Tank fuel fill opening for day tank

Accessories

❑ Inner tank leak alarm kit

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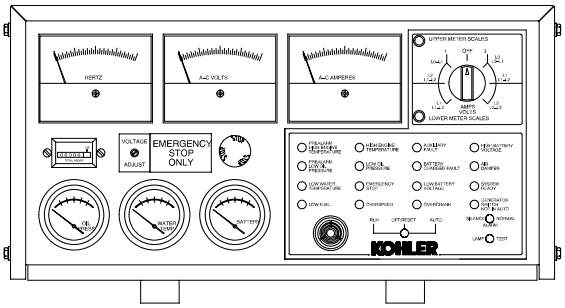
Availability is subject to change without notice. Kohler Co. reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever. Contact your local Kohler® generator distributor for availability.

G6-64 11/05e

KOHLER POWER SYSTEMS

Generator Set Controller

ISO 9001 KOHLER POWER SYSTEMS NATIONALLY REGISTERED



Decision-Maker™ 3+ Controller

General Description and Function

The generator set controller provides system control, monitoring, and diagnostics for optimum performance.

The generator set controller provides both analog AC meters and engine gauges and 16-light annunciation of shutdowns, warnings, and status events.

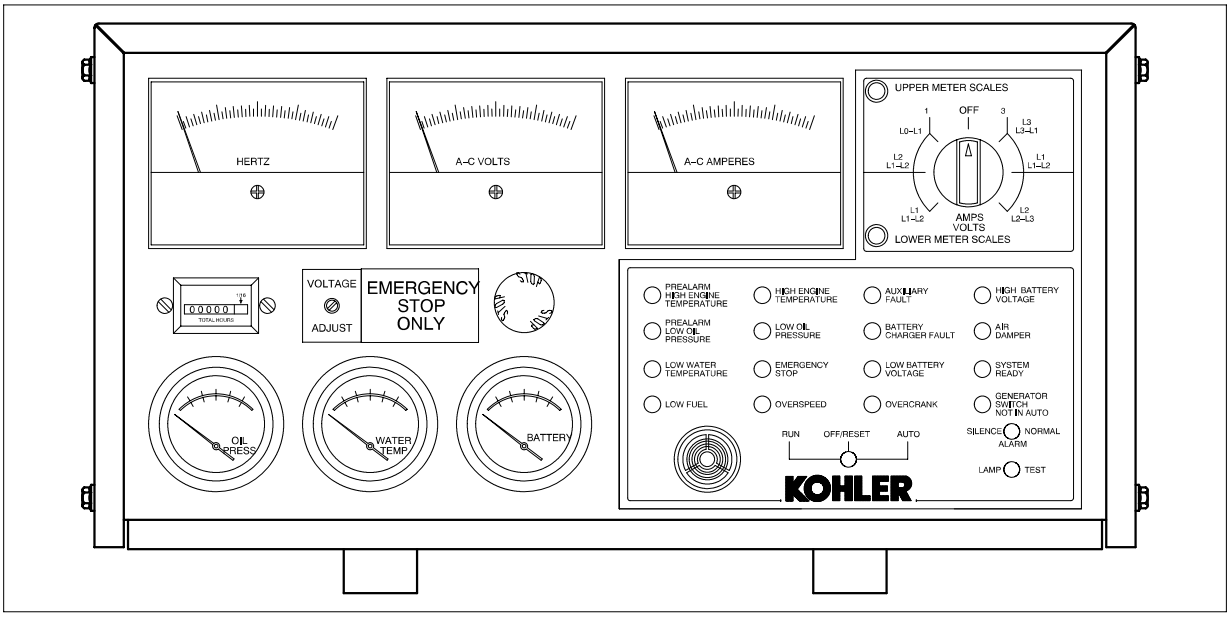
Standard Features

- Supports Modbus® RTU (Remote Terminal Unit) communication protocol via RS-485 networks.
- Supports CANbus J1939 communication protocol for ECM engines
- Contains microcomputer-based logic with a ROM (read-only memory)-based control algorithm.
- Features upgradeable software for new system functionality.
- Provides overspeed protection, cooldown mode, and a selectable crank mode.
- Provides audio and visual alarms.
- Features analog meters and engine gauges.
- Meets the National Fire Protection Association requirements of NFPA 99 and NFPA 110 with additional accessories. NFPA 110, Level 1 requirements typically apply to health care facilities; NFPA 110, Level 2 requirements apply to less-critical applications.
- Uses conformal coated circuit boards for environmental durability.

Modbus® is a registered trademark of Schneider Electric.

G6-30 9/05j

Decision-Maker™ 3+, 16-Light Controller



Controller Features

General Specifications

- Power source with circuit protection: 12- or 24-volt DC
- Power draw: 220 milliamps in system ready mode (or 200 milliamps without panel lamps)
- Humidity range: 5% to 95% noncondensing
- Operating temperature range: –40°C to +70°C (–40°F to +158°F)
- Storage temperature range: –40°C to +85°C (–40°F to +185°F)
- Standards:
  - NFPA 99
  - NFPA 110
  - UL 508
- Dimensions—W x H x D, 461 x 247 x 297 mm (18.15 x 9.71 x 11.68 in.)

Hardware Features

- AC interlock to prevent starter reengagement with engine running
- Battery (DC) circuits are fuse protected
- Controller mounts locally or remotely up to a distance of 12 m (40 ft.) and viewed from one of four positions
- LEDs for visual annunciation
- Gauges and meters for system data

Communication Features

- Supports Modbus® RTU (Remote Terminal Unit) via RS-485 (Comm. module GM32644-KA1 or GM32644-KP1 required)
- Supports Modbus® TCP (Transmission Control Protocol) via Ethernet (Converter GM41143-KP1 required)
- Supports CANbus J1939 communication protocol

Modbus® is a registered trademark of Schneider Electric.

NFPA Requirements

- In order to meet NFPA 110, Level 1 requirements the generator set controller must monitor and display specific engine/generator safety indications and shutdowns
- Engine functions:
  - Overcrank shutdown
  - High engine temperature shutdown
  - High engine temperature warning *
  - Low water (engine) temperature warning *
  - Low oil pressure warning *
  - Low oil pressure shutdown
  - Overspeed shutdown
  - Low fuel (level or pressure) warning *
  - Low coolant level (auxiliary fault) shutdown
  - High battery voltage warning *
  - Low battery voltage warning *
  - Air damper indicator
- General functions:
  - Battery charger warning *
  - Master switch not-in-auto
  - Lamp test
  - Audible alarm silence

* Requires optional input sensors on some generator set models

Standard Features

- Sixteen LED indicating lights for status, warnings, and shutdowns
- Status indicators:
  - Air damper (red) (if equipped)*
  - Master switch not-in-auto (red)
  - System ready (green)
- Warning indicators:
  - Auxiliary (multiple function)(red)
  - Battery charger (red)*
  - Fuel, low—level or pressure (red)*
  - Pressure, low oil (yellow)*
  - Temperature, low water (engine) (red)*
  - Temperature, high engine (yellow)*
  - Voltage, high battery (yellow)*
  - Voltage, low battery (red)*
- Shutdown indicators:
  - Auxiliary (multiple function)(red)
  - Emergency stop (red)*
  - Low fuel (utilizes auxiliary indicator)(red); 125RZG model only
  - Level, low coolant (utilizes auxiliary indicator) (available with radiator-mounted generator set models only)
  - Overcrank (red)
  - Overspeed (red)
  - Temperature, high engine (red)
  - Pressure, low oil (red)
  - Underfrequency (utilizes auxiliary indicator)(red)
- Panel illumination lamps (2)
- Analog gauges, 51 mm (2 in.):
  - Pressure gauge, oil
  - Temperature gauge, engine cooling system
  - Voltmeter, DC battery
- Analog meters, 89 mm (3.5 in.):
  - AC ammeter, 2% of full-scale accuracy
  - AC voltmeter, 2% of full-scale accuracy
  - Frequency meter, 0.5% of full-scale accuracy
- Running time meter
- Switches and standard features:
  - Horn, alarm (with silencing switch)
  - Mode, prime power via jumper selection
  - Potentiometer, generator output voltage-adjusting (front panel mounted, ±5% of nominal voltage) (350–2000 kW models have adjustment on voltage regulator in junction box)
  - Shutdown, overvoltage protection
  - Switch, latch-type emergency stop (standard on most 200–2000 kW generator set models)
  - Switch, lamp test
  - Switch, meter range selector
  - Switch, run, off/reset, auto (engine start) generator set master
  - Timer, engine cooldown, (5-minute fixed)
- Eight DIP switches for control and communication:
  - Cooldown disable
  - Crank mode select for continuous or cyclic cranking. The cranking provides up to 30 seconds of continuous cranking or 75 seconds of cyclic cranking (crank 15 seconds, rest 15 seconds, crank 15 seconds, etc.). The crank disconnect speed is 750 rpm (25 Hz).
  - Engine communication setting (2)
  - Modbus® addresses (bit 0, bit 1, bit 2)
  - Overspeed protection selection of 60 Hz for 50 Hz models or 70 Hz for 60 Hz models
- Terminal strips:
  - Terminal strip connections for 2-wire remote start
  - Terminal strip connections for 2-wire (series connection) remote emergency stop
  - Terminal strip connections for remote annunciator
  - Terminal strip connections for remote dry contact kit
  - Terminal strip connections for prime power feature (prevents battery drain when not in use and no battery charger connected)
- LEDs on circuit board for troubleshooting diagnosis
  - Crank fault
  - Emergency stop
  - Overvoltage fault
  - Run operation

* Requires optional kit or user-provided device to enable function and lamp indication.

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Selected Decision-Maker™ 3+ Accessories

- ❑ **Common Failure Relay** remotely signals auxiliary fault, emergency stop, high engine temperature, low oil pressure, overcrank, and overspeed via one single-pole, double-throw relay with 10 amp at 120 VAC, 10 amp at 28 VDC contacts.
- ❑ **Controller Cable,** 12 m (40 ft.), enables remote mounting of the controller.
- ❑ **Controller Connection Kit** provides a cable connecting the controller to a terminal strip in the junction box. Specify the controller connection kit for junction box remote device connections.
- ❑ **Dry Contact Kits** interface between the controller signals and customer-supplied accessories providing contact closure to activate warning devices such as lamps or horns. Kits are available in either one or ten single-pole, double-throw relays with 3 amp at 250 VAC contacts. A kit with twenty single-pole, double- throw relays with 3 amp at 250 VAC contacts is available on 450–2000 kW models.
- ❑ **FASTCHECK®** hand-held diagnostic fault detector activates controller circuits without operating engine/generator. Helps service or maintenance personnel quickly identify faults in controller and engine circuits.
- ❑ **10 Amp Float/Equalize Battery Charger with Alarm Feature** warns controller of battery charger fault, high battery voltage, and low battery voltage.
- ❑ **6 Amp Float/Equalize Battery Charger** has automatic 3-stage charging with indicator LEDs. Durable potted assembly for full waterproofing and shockproofing. UL 1236 listed.
- ❑ **Controller-Mounted Emergency Stop Switch** shuts down generator set immediately in emergency situations. Use the generator set master switch for normal shutdowns. Standard on most 200–2000 kW generator set models (see respective generator set specification sheet for details).
- ❑ **Remote Emergency Stop Panel** immediately shuts the generator set down from a remote station.
- ❑ **Prealarms** warn of low water (engine) temperature, approaching low oil pressure, and approaching high engine temperature. Kits for gas-fueled models include a low fuel pressure switch.
- ❑ **Remote Audiovisual Panel** warns the operator of fault shutdowns and prealarm conditions. Common fault lamp and horn with silence switch.
- ❑ **Remote Serial Annunciator Panel** enables the operator to monitor the status of the generator from a remote location. May be required for NFPA 99 and NFPA 110 installations. Uses Modbus® RTU (Remote Terminal Unit), an industry standard open communication protocol.
- ❑ **Communication Module** GM32644-KA1 or GM32644-KP1 is required when using the remote serial annunciator (RSA) and/or Modbus®/Ethernet communications.
- ❑ **Remote Annunciator Panel** enables the operator to monitor the status of the generator from a remote location. May be required for NFPA 99 and NFPA 110 installations.
- ❑ **Run Relay** provides a three-pole, double-throw relay with 10 amp at 250 VAC contacts for indicating that the generator set is running or shut down.
- ❑ **Modbus®/Ethernet Converter** GM41143-KP2 for network communications.

Modbus® is a registered trademark of Schneider Electric.

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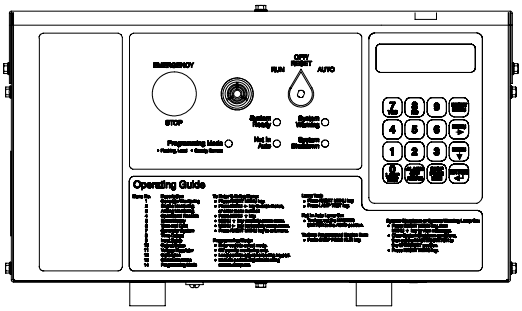
G6-30 9/05j

KOHLER POWER SYSTEMS

Generator Set Controller

ISO 9001 KOHLER POWER SYSTEMS NATIONALLY REGISTERED



Kohler® Decision-Maker™ 550 Controller

Software (Code) Version 2.10 or higher

General Description and Function

The Decision-Maker™ 550 generator set controller provides advanced control, system monitoring, and system diagnostics for optimum performance.

The Decision-Maker™ 550 generator set controller provides complete compatibility with selected engine Electronic Control Module (ECM) and non-ECM equipped generator set engines.

The Decision-Maker™ 550 generator set controller interfaces between the generator set and Kohler switchgear for paralleling applications between generator sets and/or the utility.

ECM models only: The Decision-Maker™ 550 controller directly communicates with the ECM to monitor engine parameters and diagnose engine problems (see Controller Diagnostics for details).

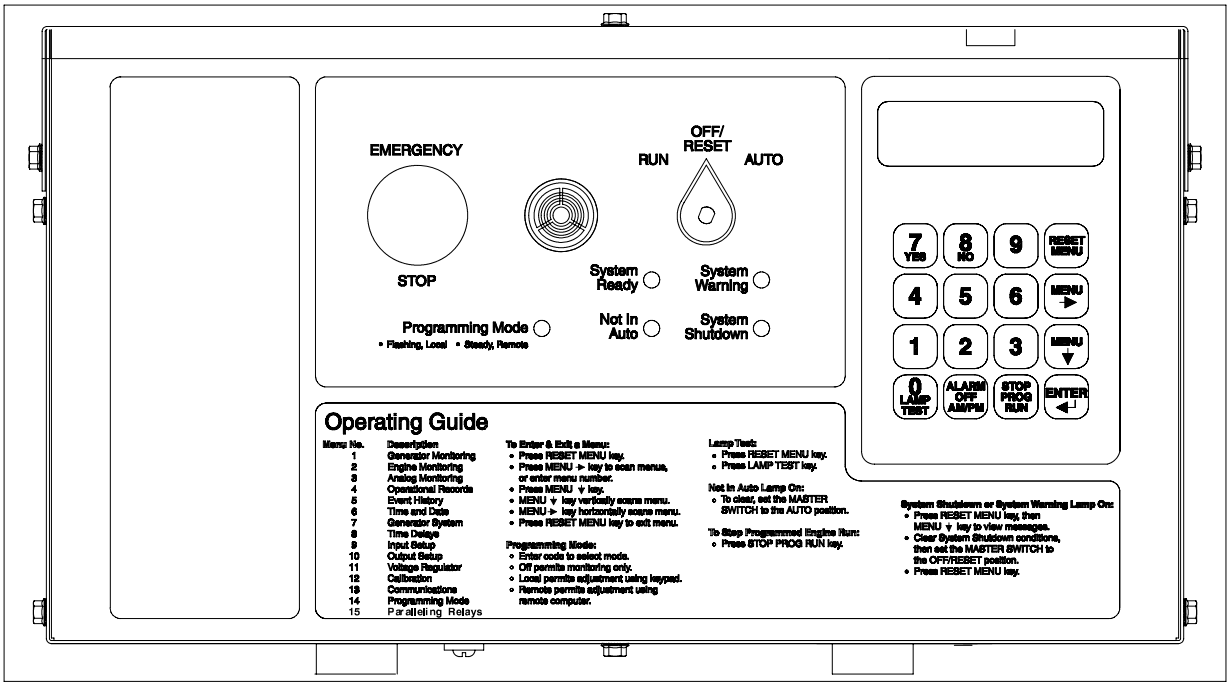
Standard Features

- The controller meets the National Fire Protection Association requirements of NFPA 99 and NFPA 110, Level 1.
- The controller is listed under Underwriter's Laboratories UL 508.
- A digital display and keypad provide access to data. A two-line vacuum fluorescent display provides complete and understandable information in either English or metric units.
- The controller can communicate directly with a personal computer, via a network, or via a modem configuration. See spec sheets G6-76, Monitor III Software, and G6-50, Decision-Maker™ 550 Communications, for more information.
- The controller supports Modbus® RTU (Remote Terminal Unit)—an industry standard open communication protocol.

Optional Features

- Monitor III, an optional menu-driven Windows®-based PC software, monitors engine and alternator parameters and also provides control capability.
- An optional paralleling feature provides user-defined functions and time delays. Menu 15 (Paralleling Relays) is available when ordering Kohler PD-Series switchgear.

Decision-Maker™ 550 Controller



Controller Features

Specifications

- Power source with circuit protection: 12- or 24-volt DC
- Power drain: 700 milliamps (or 400 milliamps without panel lamps)
- Humidity range: 5% to 95% noncondensing
- Operating temperature range: -40°C to +70°C (-40°F to +158°F)
- Storage temperature range: -40°C to +85°C (-40°F to +185°F)
- Addition of the 550 controller gives most 20–300 kW models ISO 8528-5, Class G3, compliance for transient response. See the respective generator set spec sheet for details.
- Standards:
  - NFPA 99
  - NFPA 110, Level 1
  - UL 508

Hardware Features

- Vacuum fluorescent display
- Environmentally sealed 16-button membrane keypad
- Five LED status indicating lights
- Three-position (run, off/reset, auto) selector switch
- Latch-type emergency stop switch with International Electromechanical Commission (IEC) yellow ring identification
- Alarm horn
- Fuse-protected battery circuits
- Controller mounts locally or remotely up to a distance of 12 m (40 ft.) and viewed from one of four positions
- Dimensions—W x H x D, 460 x 275 x 291 mm (18.15 x 10.8 x 11.47 in.)

NFPA Requirements

In order to meet NFPA 110, Level 1 requirements the generator set controller must monitor specific engine/generator functions and faults.

NFPA 110 Common Alarm

- Engine functions:
  - Overcrank
  - Low coolant temperature warning
  - High coolant temperature warning
  - High coolant temperature shutdown
  - Low oil pressure shutdown
  - Low oil pressure warning
  - Overspeed
  - Low fuel (level or pressure) *
  - Low coolant level
  - EPS supplying load
  - High battery voltage *
  - Low battery voltage *
  - Air damper indicator
- General functions:
  - Master switch not in auto
  - Battery charger fault *
  - Lamp test
  - Contacts for local and remote common alarm
  - Audible alarm silence switch
  - Remote emergency stop

* Requires optional input sensors on some generator set models

Control Functions

The control functions apply to both the ECM and non-ECM equipped models unless noted otherwise.

- **AC Output Voltage Adjustment**
  The voltage adjustment provides keypad adjustment in 0.1 volt increments of the average line-to-line AC output voltage with a maximum adjustment of ±10% of the system voltage.

- **Alternator Protection**
  The controller firmware provides generator set overload and short circuit protection matched to each alternator for the particular voltage/phase configuration.

- **Automatic Restart**
  The controller automatic restart feature initiates the start routine and recrank when the generator set slows to less than 390 rpm after a failed start attempt.

- **Battleswitch (Fault Shutdown Override Switch)**
  The *battleswitch* input provides the ability to override the fault shutdowns except emergency stop and overspeed shutdown in emergency situations and during generator set troubleshooting.

- **Clock and Calendar**
  Real-time clock and calendar functions time stamp shutdowns for local display and remote monitor. Also, use these functions to determine the generator start date and days of operation.

- **Cooldown Temperature Override**
  This feature provides the ability to bypass (override) the cooldown temperature shutdown and force the generator set to run for the full engine cooldown time delay. Also see Time Delay Engine Cooldown (TDEC).

- **Cyclic Cranking**
  The controller has programmable cyclic cranking. The customer selects the number of crank cycles (1–6) and the crank time from (10–30) seconds. The crank disconnect depends upon the speed sensor input information or the generator frequency information. The default cyclic crank setting is 15 seconds on, 15 seconds off for three cycles.

- **Digital Voltage Regulator**
  The digital voltage regulator provides ±0.25% no-load to full-load regulation.

- **Display Power Shutdown**
  To conserve battery power, the display turns off after 5 minutes of inactivity. Pressing any keypad button activates the display.

- **ECM Communication**
  The controller monitors ECM communication links and provides fault detection for oil pressure signal loss, coolant temperature signal loss, and ECM communication loss. Each of these faults provides local display, alarm horn ON, and relay driver output (RDO) on ECM models only. See Controller Diagnostics following for additional information.

- **Idle Speed Function**
  Idle speed function provides the ability to start and run the engine at idle speed for a selectable time period. The engine will go to normal speed should the temperature reach warm-up before the time delay is complete.

- **Lamp Test**
  Keypad switch verifies functionality of the indicator LEDs, alarm horn, and digital display.

- **Load Shed**
  The load shed function provides a load control output (RDO) with user selectable load shed level.

- **Master Switch Fault**
  The generator set master switch has fault detection at four levels: 1) master switch to off, 2) master switch open, 3) master switch error, and 4) master switch not in auto. Each of these faults/warnings provides local display, alarm horn on, and activates a relay driver output (RDO). By placing the master switch to the OFF/RESET position all generator set faults can be reset.

- **Modbus® Interface**
  The Modbus® interface provides industry standard open protocol for communication between the generator set controller and other devices or for network communications.

- **Number of Starts**
  Total number of generator successful starts is recorded and displayed on the local display and remote PC monitor. This information is a resettable and total record.

- **Programming Access**
  The setup access and programming information is password protected. When locally accessing programming information, the PM (programming mode) LED flashes. When remotely accessing programming information, the PM LED is steady.

- **Programmed Run**
  The programmed run function provides user-selectable time for a one-time exercising of the generator set. The controller does not provide weekly scheduled exercise periods.

- **Remote Reset**
  The remote reset function resets faults and allows restarting of the generator without going to the master switch off/reset position. The remote reset function is initiated via the remote reset digital input.

- **Running Time Hourmeter**
  The running time hourmeter function is available on the local display and remote monitor. The information displayed uses real time loaded and unloaded run time as an actual and resettable record.

- **Self-Test**
  The controller has memory protection and microprocessor self-test.

- **Starting Aid**
  The starting aid feature provides control for an ether injection system. This setup has adjustable *on* time before engine crank from 0–10 seconds. This feature is also part of the remote communication option.

- **Time Delay Engine Cooldown (TDEC)**
  The TDEC provides a user selectable time delay before the generator set shuts down.
  If the engine is *above* the preset temperature and the unit is signalled to shut down, the unit will continue to run for the duration of the TDEC.
  If the engine is *at or below* the preset temperature and the unit is signalled to shut down or the TDEC is running, the unit will shut down without waiting for the time delay to expire.
  Also see Cooldown Temperature Override.

- **Time Delay Engine Start (TDES)**
  The TDES provides a user selectable time delay before the generator set starts.

Controller Diagnostics

The controller features warnings and shutdowns as text messages on the vacuum fluorescent display. See the table below.

Warnings show yellow LED and signal an impending problem.
Shutdowns show red LED and stop the generator set.

User-Defined Common Fault and Status. The user customizes outputs through a menu of warnings, shutdowns, and status conditions. User defines up to 31 Relay Driver Outputs **(RDOs)** (relays not included).

Note: The available user inputs are dependent on factory reserved inputs for specific engine types, engine controls, and paralleling applications.

Note: Menu 15 features are available by purchasing the paralleling switchgear option.

Standard Controller (see next page for model applications and exceptions)	Warning Function	Shutdown Function	User-Defined	User RDOs
Engine Functions				
Air damper control, if equipped			X	X
Air damper indicator, if equipped		X	X	X
Coolant temp. signal loss		X	X	X
High battery voltage	X		X	X
High coolant temperature	X	X	X	X
High oil temp. shutdown		X	X	X
Low battery voltage	X		X	X
Low coolant level		X	X	X
Low coolant temperature	X		X	X
Low fuel level (diesel models)*	X		X	X
Low fuel pressure (gas models)*	X		X	X
Low oil pressure	X	X	X	X
Oil pressure signal loss		X	X	X
Overcrank		X	X	X
Overspeed		X	X	X
Speed sensor fault	X		X	X
Starting aid			X	X
Weak battery	X		X	X
General Functions				
Auxiliary inputs 0–5 VDC—up to 7 analog	X	X	X	X
Auxiliary inputs—up to 21 digital	X	X	X	X
Battery charger fault*	X		X	X
Defined common fault†			X	X
EEPROM write failure		X	X	X
Emergency stop		X	X	X
Engine cooldown delay			X	X
Engine start delay			X	X
EPS supplying load	X		X	X
Internal fault		X	X	X
Load shed kW overload	X		X	X
Load shed underfrequency	X		X	X
Master switch error		X	X	X
Master switch not in auto	X		X	X
Master switch open		X	X	X
Master switch to off		X	X	X
NFPA 110 common alarm			X	X
SCRDO's 1–4 (software controlled RDOs)			X	X
System ready (status)			X	X
Generator Functions				
AC sensing loss	X	X	X	X
Alternator protection		X	X	X
Critical overvoltage		X	X	X
Generator running			X	X
Ground fault*	X		X	X
Locked rotor		X	X	X

Standard Controller	Warning Function	Shutdown Function	User-Defined	User RDOs
Overcurrent	X		X	X
Overfrequency		X	X	X
Overvoltage		X	X	X
Underfrequency		X	X	X
Undervoltage		X	X	X
Menu 15 Enabled Enhancements				
Breaker trip			‡	X
Common protective relay output			X	X
Loss of field		X	X	X
Overcurrent		X	X	X
Overpower		X	X	X
Reverse power		X	X	X
In synchronization			‡	X
Waukesha-Powered Engine Enhancements				
Air/fuel module shutdown		X	‡	X
Air/fuel module engine start delay			X	X
Air/fuel module remote start			X	X
Detonation fault	X	X	‡	
Fuel valve relay			X	X
High oil temp. warning	X		X	X
Intake air temperature	X	X	X	X
Knock fault		X	‡	X
No intake air temp. signal		X	X	X
No oil temp. signal		X	X	X
Prelube relay			X	X
DDC/MTU-Powered Engine and MDEC Enhancements				
Block heater control §			X	X
ECM communications loss		X	X	X
High oil temp. warning	X		X	X
Intake air temperature	X	X	X	X
Load shed overtemperature			X	X
Low coolant temperature	X	X	X	X
MDEC red alarm		X	X	X
MDEC yellow alarm	X		X	X
275–400REOZV Engine Enhancements				
ECM communications loss		X	X	X
125 kW with 8.1 L GM Engine Enhancements				
Low fuel pressure		X	‡	X

* Requires optional input sensors on some models.
† Factory default settings for the defined common fault are emergency stop, high coolant temperature shutdown, low oil pressure shutdown, overcrank, and overspeed.
‡ Factory set inputs that are fixed and not user changeable.
§ For future applications.

Controller Monitoring

Standard Equipment and Features

- Alarm horn
- Indicators:
  - Not in auto (yellow)
  - Program mode (yellow)
  - System ready (green)
  - System shutdown (red)
  - System warning (yellow)
- Switches and standard features:
  - Keypad, 16-button multi-function sealed membrane
  - Lamp test
  - Switch, auto, off/reset, run (engine start)
  - Switch, emergency stop (normally closed contacts)
- Vacuum fluorescent display with two lines of 20 characters

Displays

Some engine displays are dependent upon enhanced electronic engine control availability.

- Engine monitoring data (metric or English units):
  - Battery voltage
  - Coolant—level †
  - Coolant—pressure †
  - Coolant—temperature
  - Engine start countdown
  - Fuel—pressure †‡§‖
  - Fuel—temperature †‡§
  - Fuel rate expressed as L/hr. (gal./hr.) †
  - Fuel—used last run expressed as L (gal.) is the accumulated fuel qty. used since last reset by the DDC engine DDEC reader †
  - Oil—level and crankcase pressure †
  - Oil—pressure
  - Oil—temperature †‡§
  - Rpm
  - Temperature—ambient †
  - Temperature—intake air ‡§
- Engine setpoints
  - Coolant—high temperature shutdown and warning setpoints
  - Oil—low pressure shutdown and warning setpoints
  - Temperature—engine cooled down setpoint
  - Temperature—engine warmed up setpoint
- Generator monitoring data:
  - Current (L1, L2, L3), ±0.25% accuracy
  - Frequency, ±0.5% accuracy
  - Kilowatts, total per phase (L1, L2, L3), ±0.5% accuracy
  - KVA, total per phase (L1, L2, L3), ±0.5% accuracy
  - KVAR, total absorbing/generating per phase (L1, L2, L3), ±0.5% accuracy
  - Percent alternator duty level (actual load kW/standby kW rating)
  - Power factor per phase, leading/lagging
  - Voltage (line-to-line, line-to-neutral for all phases), ±0.25% accuracy
- Operational records:
  - Event history (stores up to 100 system events)
  - Last start date
  - Number of starts
  - Number of starts since last maintenance
  - Operating days since last maintenance
  - Operating mode—standby or prime power
  - Run time (total, loaded and unloaded hours, and total kW hours)
  - Run time since maintenance (total, loaded, and unloaded hours and total kW hours)
  - System shutdowns
  - System warnings
  - Time, date, and day of week
- Time delays—general:
  - Crank cycles for on/pause
  - Crank cycles for overcrank shutdown
  - Engine cooldown
  - Engine start
  - Load shed
  - Voltage, over- and under-
  - Starting aid
- Time Delays—paralleling relays (PR) for optional switchgear applications:
  - Current—over (PR)
  - Current—over shutdown
  - Frequency—over- and under- (PR and shutdown)
  - Loss of field (PR and shutdown)
  - Loss of field shutdown (PR)
  - Power—over (PR)
  - Power—over shutdown
  - Reverse power (PR)
  - Reverse power shutdown
  - Synch matching—frequency, phase, voltage
  - Voltage—over- and under- (PR and shutdown)
- System parameters:
  - Alternator number
  - Current, rated (based on kW, voltage, connection settings)
  - ECM serial number †
  - Engine model number †
  - Engine serial number †
  - Frequency
  - Generator set model number
  - Generator set serial number
  - Generator set spec number
  - kW Rating
  - Phase, single and three (wye or delta)
  - Unit number ‡
  - Voltage, AC
  - Voltage configuration, wye or delta

Inputs

- Customer and remote inputs:
  - Analog inputs 0–5 VDC (up to 7 user-defined analog inputs with multiple shutdown and warning levels)
  - Digital contact inputs (up to 21 user-defined digital inputs with shutdown or warning levels)
  - Ground fault detector *
  - Remote emergency stop
  - Remote reset
  - Remote 2-wire start
- Digital inputs (standard):
  - Air damper fault, if equipped
  - Air/fuel module shutdown §
  - Battery charger fault *
  - Battleswitch
  - Detonation shutdown §
  - Detonation warning §
  - Emergency stop
  - Field overvoltage (350 kW and higher)
  - High oil temperature
  - Idle mode active (ECM models only) †‡
  - Knock shutdown §
  - Low coolant level
  - Low coolant temperature
  - Low fuel warning *
  - Low fuel shutdown (standard on 125RZG) *
- Switchgear inputs in Menu 15 (to interface with switchgear system):
  - Circuit breaker closed
  - Enable synch
  - Lockout shutdown
  - Remote reset
  - Remote shutdown
  - VAR/PF mode selection
  - Voltage—raise/lower (or VAR/PF raise/lower in VAR/PF mode)

Outputs

See the Fault Diagnostics section for a breakdown of the available shutdown and warning functions.

- Thirty-one user-defined relay driver outputs (relays not included)
  - Fifteen NFPA 110 faults
  - Defined common faults

Communication

- RS-485 connector for Modbus® RTU communication port
- RS-232 connector for a PC or modem (optional software required)
- SAE J1939 connector for the engine ECM (engine control module)

* Requires optional input sensors on some models.
† Standard on 200–275 kW gas and 230–500 kW diesel DDC engines with DDEC only.
‡ Standard on DDC/MTU engines with MDEC only.
§ Standard on Waukesha engines only.
‖ Standard on 150–200 kW with John Deere 6068HF275 engines only.

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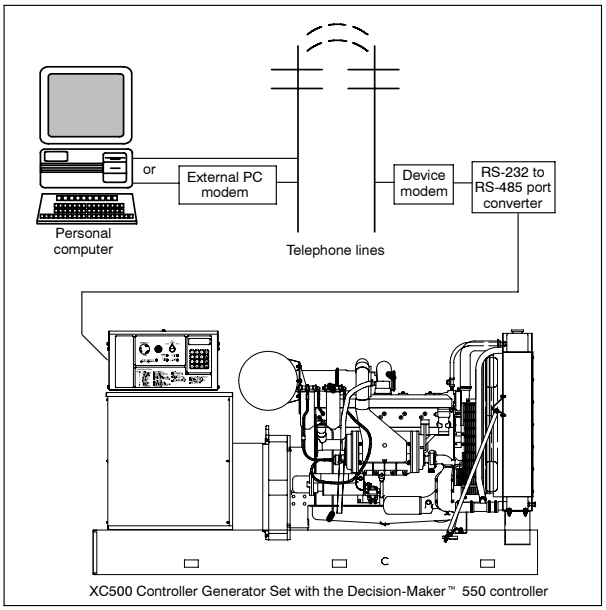
Decision-Maker™ 550 Accessories

Communication and PC Software Accessories

Refer to spec sheets G6-76, Monitor III Software, and G6-50, Decision-Maker™ 550 Communications, for additional communication and PC software information including Modbus® communication.

- ❑ **Local Single Connection.** A PC is connected directly to the device communication module with an RS-232 cable for applications where the PC is within 15 m (50 ft.) of the device or RS-485 cable for applications where the PC is up to 1220 m (4000 ft.) from the device.
- ❑ **Local Area Network (LAN).** A PC is connected directly to the device's local area network. A LAN is a system of connecting more than one device to a single PC.
- ❑ **Remote Network (Ethernet):** A PC with a NIC card uses an Ethernet connection to access a remotely located converter (Modbus®/Ethernet) serving a 550 controller. Refer to G6-79 for system details.
- ❑ **Remote Network (Modem):** A PC uses a modem to connect to a remotely located device modem serving a 550 controller. Monitoring software (Monitor III) runs on the PC to view system operation.
- ❑ **Monitor III Software for Monitoring and Control (Windows®-based user interface)**
- ❑ **Converter, Modbus®/Ethernet.** Supports a power system using 550 controllers accessed via the Ethernet. Converter is supplied with an IP address by the site administrator. Refer to G6-79 for converter details.
- ❑ **RS-232 to RS-485 Port Converters**



XC500 Controller Generator Set with the Decision-Maker™ 550 controller

Availability is subject to change without notice. Kohler Co. reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever. Contact your local Kohler® generator set distributor for availability.

Other Accessories

- ❑ **Common Failure Relay** remotely signals auxiliary fault, emergency stop, high engine temperature, low oil pressure, overcrank, and overspeed via one single-pole, double-throw relay with 10 amp contacts at 120 VAC or 28 VDC maximum.
- ❑ **Run Relay** provides a three-pole, double-throw relay with 10 amp contacts at 120 VAC or 28 VDC maximum for indicating that the generator set is running.
- ❑ **Controller Cable** enables remote mounting of the controller with distances of up to 12 m (40 ft.) from the generator set.
- ❑ **Controller Connection Kit** provides a cable connecting the controller output terminals to a terminal strip in the junction box.
- ❑ **Dry Contact Kit** interfaces between the controller signals and customer-supplied accessories providing contact closure to activate warning devices such as lamps or horns. Kits are available with either one or ten single-pole, double-throw relays with 10 amp contacts at 120 VAC or 28 VDC maximum.
- ❑ **Float/Equalize Battery Charger with Alarm Feature** signals controller of battery charger fault.
- ❑ **Key-Controlled, Master Switch** with three positions for run, off/reset, and auto functions. Allows lockout of user access. Available as an Engineered Special only.
- ❑ **Paralleling Relay (Menu 15)** functions via Modbus® communications. Order with Kohler PD-Series switchgear equipment.
- ❑ **Prealarm Kit for NFPA 110 (Gas Fuel Models only)** warns the operator of low fuel pressure. Select the kit based on LP vapor or natural gas, combination dual fuel, or LP liquid withdrawal.
- ❑ **Prime Power Switch** prevents battery drain during generator set non-operation periods and when the generator set battery cannot be maintained by an AC battery charger.
- ❑ **Remote Serial Annunciator Panel** enables the operator to monitor the status of the generator from a remote location. May be required for NFPA 99 and NFPA 110 installations. Uses Modbus® RTU (Remote Terminal Unit), an industry standard open communication protocol.
- ❑ **Remote Audiovisual Alarm Panel** warns the operator of fault shutdowns and warning conditions. Kit includes common fault lamp and horn with silence switch.
- ❑ **Remote Emergency Stop Panel** immediately shuts the generator set down from a remote station.

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Windows® is a registered trademark of Microsoft Corporation.

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Appendix E | Mechanical Calculations

System Checksums

By PENN STATE UNIVERSITY

System - 001 **VAV w/Baseboard Heating**

COOLING COIL PEAK

Peaked at Time: Mo/Hr: 7 / 18
Outside Air: OADB/WB/HR: 89 / 77 / 119

	Space Sens. + Lat. Btu/h	Plenum Sens. + Lat Btu/h	Net Total Btu/h	Percent Of Total (%)
Envelope Loads				
Skylite Solar	0	0	0	0
Skylite Cond	0	0	0	0
Roof Cond	0	6,319	6,319	2
Glass Solar	126,770	0	126,770	49
Glass Cond	12,280	0	12,280	5
Wall Cond	1,649	6,226	7,876	3
Partition	0		0	0
Floor	0		0	0
Adjacent Floor	0	0	0	0
Infiltration	14,276		14,276	5
Sub Total ==>	154,976	12,546	167,521	64
Internal Loads				
Lights	18,200	0	18,200	7
People	15,256	0	15,256	6
Misc	18,200	0	18,200	7
Sub Total ==>	51,657	0	51,657	20
Ceiling Load	1,703	-1,703	0	0
Ventilation Load	0	0	27,810	11
Adj Air Trans Heat	0		0	0
Dehumid. Ov Sizing			0	0
Ov/Undr Sizing	0		0	0
Exhaust Heat		-870	-870	0
Sup. Fan Heat			14,066	5
Ret. Fan Heat		1	1	0
Duct Heat Pkup		0	0	0
Underflr Sup Ht Pkup			0	0
Supply Air Leakage		0	0	0
Grand Total ==>	208,335	9,974	260,185	100.00

CLG SPACE PEAK

Mo/Hr: 6 / 18
OADB: 82

	Space Sensible Btu/h	Percent Of Total (%)
Envelope Loads		
Skylite Solar	0	0
Skylite Cond	0	0
Roof Cond	0	0
Glass Solar	137,465	71
Glass Cond	6,267	3
Wall Cond	1,535	1
Partition	0	0
Floor	0	0
Adjacent Floor	0	0
Infiltration	1,751	1
Sub Total ==>	147,019	76
Internal Loads		
Lights	18,200	9
People	8,475	4
Misc	18,200	9
Sub Total ==>	44,876	23
Ceiling Load	1,567	1
Ventilation Load	0	0
Adj Air Trans Heat	0	0
Ov/Undr Sizing	0	0
Grand Total ==>	193,462	100.00

HEATING COIL PEAK

Mo/Hr: Heating Design
OADB: 7

	Space Peak Space Sens Btu/h	Coil Peak Tot Sens Btu/h	Percent Of Total (%)
Envelope Loads			
Skylite Solar	0	0	0.00
Skylite Cond	0	0	0.00
Roof Cond	0	-4,912	3.28
Glass Solar	0	0	0.00
Glass Cond	-55,553	-55,553	37.05
Wall Cond	-1,876	-8,679	5.79
Partition	0	0	0.00
Floor	0	0	0.00
Adjacent Floor	0	0	0
Infiltration	-16,767	-16,767	11.18
Sub Total ==>	-74,196	-85,911	57.29
Internal Loads			
Lights	0	0	0.00
People	0	0	0.00
Misc	0	0	0.00
Sub Total ==>	0	0	0.00
Ceiling Load	-3,825	0	0.00
Ventilation Load	0	-32,661	21.78
Adj Air Trans Heat	0	0	0
Ov/Undr Sizing	0	0	0.00
Exhaust Heat		1,954	-1.30
OA Preheat Diff.		0	0.00
RA Preheat Diff.		-33,329	22.23
Additional Reheat		0	0.00
Underflr Sup Ht Pkup		0	0.00
Supply Air Leakage		0	0.00
Grand Total ==>	-78,021	-149,947	100.00

TEMPERATURES

	Cooling	Heating
SADB	55.0	70.0
Ra Plenum	76.1	67.5
Return	76.1	67.5
Ret/OA	76.8	56.7
Fn MtrTD	0.2	0.0
Fn BldTD	0.3	0.0
Fn Frict	1.0	0.0

AIRFLOWS

	Cooling	Heating
Diffuser	8,590	2,577
Terminal	8,590	2,577
Main Fan	8,590	2,577
Sec Fan	0	0
Nom Vent	460	460
AHU Vent	460	460
Infil	236	236
MinStop/Rh	2,577	2,577
Return	8,827	2,813
Exhaust	697	697
Rm Exh	0	0
Auxiliary	0	0
Leakage Dwn	0	0
Leakage Ups	0	0

ENGINEERING CKS

	Cooling	Heating
% OA	5.4	17.9
cfm/ft²	1.77	0.53
cfm/ton	396.20	
ft²/ton	223.59	
Btu/hr·ft²	53.67	-30.93
No. People	34	

COOLING COIL SELECTION

	Total Capacity ton	Total Capacity MBh	Sens Cap. MBh	Coil Airflow cfm	Enter DB °F	Enter WB °F	Enter HR gr/lb	Leave DB °F	Leave WB °F	Leave HR gr/lb
Main Clg	21.7	260.2	222.0	8,477	76.8	61.9	58.2	53.5	51.2	51.7
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	21.7	260.2								

AREAS

	Gross Total ft²	Glass ft²	Glass (%)
Floor	4,848		
Part	0		
ExFlr	0		
Roof	1,933	0	0
Wall	4,498	3,075	68

HEATING COIL SELECTION

	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F
Main Htg	-125.8	0	0.0	0.0
Aux Htg	0.0	0	0.0	0.0
Preheat	-24.1	460	7.0	53.5
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
Total	-150.0			

Project Name: Sherrerd Hall
Dataset Name: F:\THESIS\CALCS\MECHANICAL\OFFICE23.TRC

TRACE® 700 v6.2 calculated at 09:53 PM on 03/30/2010
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System Checksums

By PENN STATE UNIVERSITY

System - 001 — **VAV w/Baseboard Heating**

COOLING COIL PEAK

Peaked at Time: Mo/Hr: 7 / 18
Outside Air: OADB/WB/HR: 89 / 77 / 119

	Space Sens. + Lat. Btu/h	Plenum Sens. + Lat Btu/h	Net Total Btu/h	Percent Of Total (%)
Envelope Loads				
Skylite Solar	0	0	0	0
Skylite Cond	0	0	0	0
Roof Cond	0	6,332	6,332	2
Glass Solar	164,793	0	164,793	54
Glass Cond	13,334	0	13,334	4
Wall Cond	1,649	6,244	7,894	3
Partition	0		0	0
Floor	0		0	0
Adjacent Floor	0	0	0	0
Infiltration	14,422		14,422	5
Sub Total ==>	194,198	12,577	206,775	68
Internal Loads				
Lights	18,200	0	18,200	6
People	15,256	0	15,256	5
Misc	18,200	0	18,200	6
Sub Total ==>	51,657	0	51,657	17
Ceiling Load	1,457	-1,457	0	0
Ventilation Load	0	0	28,095	9
Adj Air Trans Heat	0		0	0
Dehumid. Ov Sizing			0	0
Ov/Undr Sizing	0		0	0
Exhaust Heat		-744	-744	0
Sup. Fan Heat			16,927	6
Ret. Fan Heat		1	1	0
Duct Heat Pkup		0	0	0
Underflr Sup Ht Pkup			0	0
Supply Air Leakage		0	0	0
Grand Total ==>	247,312	10,375	302,710	100.00

CLG SPACE PEAK

Mo/Hr: 6 / 18
OADB: 82

	Space Sensible Btu/h	Percent Of Total (%)
Envelope Loads		
Skylite Solar	0	0
Skylite Cond	0	0
Roof Cond	0	0
Glass Solar	178,639	76
Glass Cond	6,803	3
Wall Cond	1,535	1
Partition	0	0
Floor	0	0
Adjacent Floor	0	0
Infiltration	1,751	1
Sub Total ==>	188,728	80
Internal Loads		
Lights	18,200	8
People	8,475	4
Misc	18,200	8
Sub Total ==>	44,876	19
Ceiling Load	1,331	1
Ventilation Load	0	0
Adj Air Trans Heat	0	0
Dehumid. Ov Sizing		
Ov/Undr Sizing	0	0
Grand Total ==>	234,935	100.00

HEATING COIL PEAK

Mo/Hr: Heating Design
OADB: 7

	Space Peak Space Sens Btu/h	Coil Peak Tot Sens Btu/h	Percent Of Total (%)
Envelope Loads			
Skylite Solar	0	0	0.00
Skylite Cond	0	0	0.00
Roof Cond	0	-4,934	2.99
Glass Solar	0	0	0.00
Glass Cond	-60,543	-60,543	36.75
Wall Cond	-1,876	-8,711	5.29
Partition	0	0	0.00
Floor	0	0	0.00
Adjacent Floor	0	0	0
Infiltration	-16,767	-16,767	10.18
Sub Total ==>	-79,185	-90,955	55.21
Internal Loads			
Lights	0	0	0.00
People	0	0	0.00
Misc	0	0	0.00
Sub Total ==>	0	0	0.00
Ceiling Load	-3,394	0	0.00
Ventilation Load	0	-32,661	19.82
Adj Air Trans Heat	0	0	0
Ov/Undr Sizing	0	0	0.00
Exhaust Heat		1,734	-1.05
OA Preheat Diff.		0	0.00
RA Preheat Diff.		-42,871	26.02
Additional Reheat		0	0.00
Underflr Sup Ht Pkup		0	0.00
Supply Air Leakage		0	0.00
Grand Total ==>	-82,579	-164,753	100.00

TEMPERATURES

	Cooling	Heating
SADB	55.0	70.0
Ra Plenum	76.0	67.8
Return	76.0	67.8
Ret/OA	76.5	58.9
Fn MtrTD	0.2	0.0
Fn BldTD	0.3	0.0
Fn Frict	1.0	0.0

AIRFLOWS

	Cooling	Heating
Diffuser	10,432	3,130
Terminal	10,432	3,130
Main Fan	10,432	3,130
Sec Fan	0	0
Nom Vent	460	460
AHU Vent	460	460
Infil	236	236
MinStop/Rh	3,130	3,130
Return	10,668	3,366
Exhaust	697	697
Rm Exh	0	0
Auxiliary	0	0
Leakage Dwn	0	0
Leakage Ups	0	0

ENGINEERING CKS

	Cooling	Heating
% OA	4.4	14.7
cfm/ft²	2.15	0.65
cfm/ton	413.54	
ft²/ton	192.18	
Btu/hr·ft²	62.44	-33.98
No. People	34	

COOLING COIL SELECTION

	Total Capacity ton	Total Capacity MBh	Sens Cap. MBh	Coil Airflow cfm	Enter DB °F	Enter WB °F	Enter HR gr/lb	Leave DB °F	Leave WB °F	Leave HR gr/lb
Main Clg	25.2	302.7	264.1	10,201	76.5	61.5	56.6	53.5	51.0	51.2
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	25.2	302.7								

AREAS

	Gross Total ft²	Glass ft²	Glass (%)
Floor	4,848		
Part	0		
ExFlr	0		
Roof	1,933	0	0
Wall	4,498	3,075	68

HEATING COIL SELECTION

	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F
Main Htg	-140.6	0	0.0	0.0
Aux Htg	0.0	0	0.0	0.0
Preheat	-24.1	460	7.0	53.5
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
Total	-164.8			

Project Name: Sherrerd Hall
Dataset Name: F:\THESIS\CALCS\MECHANICAL\OFFICE23.TRC

TRACE® 700 v6.2 calculated at 09:53 PM on 03/30/2010
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System Checksums

By PENN STATE UNIVERSITY

System - 001 — **VAV w/Baseboard Heating**

COOLING COIL PEAK

Peaked at Time: Mo/Hr: 7 / 18
Outside Air: OADB/WB/HR: 89 / 77 / 119

	Space Sens. + Lat. Btu/h	Plenum Sens. + Lat Btu/h	Net Total Btu/h	Percent Of Total (%)
Envelope Loads				
Skylite Solar	0	0	0	0
Skylite Cond	0	0	0	0
Roof Cond	0	6,315	6,315	3
Glass Solar	116,776	0	116,776	47
Glass Cond	11,601	0	11,601	5
Wall Cond	1,649	6,220	7,869	3
Partition	0		0	0
Floor	0		0	0
Adjacent Floor	0	0	0	0
Infiltration	14,227		14,227	6
Sub Total ==>	144,252	12,535	156,787	63
Internal Loads				
Lights	18,200	0	18,200	7
People	15,256	0	15,256	6
Misc	18,200	0	18,200	7
Sub Total ==>	51,657	0	51,657	21
Ceiling Load	1,785	-1,785	0	0
Ventilation Load	0	0	27,714	11
Adj Air Trans Heat	0		0	0
Dehumid. Ov Sizing			0	0
Ov/Undr Sizing	0		0	0
Exhaust Heat		-912	-912	0
Sup. Fan Heat			13,286	5
Ret. Fan Heat		0	0	0
Duct Heat Pkup		0	0	0
Underflr Sup Ht Pkup			0	0
Supply Air Leakage		0	0	0
Grand Total ==>	197,693	9,840	248,532	100.00

CLG SPACE PEAK

Mo/Hr: 6 / 18
OADB: 82

	Space Sensible Btu/h	Percent Of Total (%)
Envelope Loads		
Skylite Solar	0	0
Skylite Cond	0	0
Roof Cond	0	0
Glass Solar	126,579	69
Glass Cond	5,917	3
Wall Cond	1,535	1
Partition	0	0
Floor	0	0
Adjacent Floor	0	0
Infiltration	1,751	1
Sub Total ==>	135,782	74
Internal Loads		
Lights	18,200	10
People	8,475	5
Misc	18,200	10
Sub Total ==>	44,876	25
Ceiling Load	1,646	1
Ventilation Load	0	0
Adj Air Trans Heat	0	0
Dehumid. Ov Sizing		
Ov/Undr Sizing	0	0
Exhaust Heat		
Sup. Fan Heat		
Ret. Fan Heat		
Duct Heat Pkup		
Underflr Sup Ht Pkup		
Supply Air Leakage		
Grand Total ==>	182,304	100.00

HEATING COIL PEAK

Mo/Hr: Heating Design
OADB: 7

	Space Peak Space Sens Btu/h	Coil Peak Tot Sens Btu/h	Percent Of Total (%)
Envelope Loads			
Skylite Solar	0	0	0.00
Skylite Cond	0	0	0.00
Roof Cond	0	-4,904	3.40
Glass Solar	0	0	0.00
Glass Cond	-52,370	-52,370	36.33
Wall Cond	-1,876	-8,669	6.01
Partition	0	0	0.00
Floor	0	0	0.00
Adjacent Floor	0	0	0
Infiltration	-16,767	-16,767	11.63
Sub Total ==>	-71,013	-82,711	57.38
Internal Loads			
Lights	0	0	0.00
People	0	0	0.00
Misc	0	0	0.00
Sub Total ==>	0	0	0.00
Ceiling Load	-3,961	0	0.00
Ventilation Load	0	-32,661	22.66
Adj Air Trans Heat	0	0	0
Ov/Undr Sizing	0	0	0.00
Exhaust Heat		2,023	-1.40
OA Preheat Diff.		0	0.00
RA Preheat Diff.		-30,793	21.36
Additional Reheat		0	0.00
Underflr Sup Ht Pkup		0	0.00
Supply Air Leakage		0	0.00
Grand Total ==>	-74,973	-144,142	100.00

TEMPERATURES

	Cooling	Heating
SADB	55.0	70.0
Ra Plenum	76.2	67.4
Return	76.2	67.4
Ret/OA	76.9	56.0
Fn MtrTD	0.2	0.0
Fn BldTD	0.3	0.0
Fn Frict	1.0	0.0

AIRFLOWS

	Cooling	Heating
Diffuser	8,095	2,428
Terminal	8,095	2,428
Main Fan	8,095	2,428
Sec Fan	0	0
Nom Vent	460	460
AHU Vent	460	460
Infil	236	236
MinStop/Rh	2,428	2,428
Return	8,331	2,665
Exhaust	697	697
Rm Exh	0	0
Auxiliary	0	0
Leakage Dwn	0	0
Leakage Ups	0	0

ENGINEERING CKS

	Cooling	Heating
% OA	5.7	19.0
cfm/ft²	1.67	0.50
cfm/ton	390.85	
ft²/ton	234.07	
Btu/hr·ft²	51.27	-29.73
No. People	34	

COOLING COIL SELECTION

	Total Capacity ton	Total Capacity MBh	Sens Cap. MBh	Coil Airflow cfm	Enter DB °F	Enter WB °F	Enter HR gr/lb	Leave DB °F	Leave WB °F	Leave HR gr/lb
Main Clg	20.7	248.5	210.5	8,007	76.9	62.0	58.7	53.5	51.2	51.9
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	20.7	248.5								

AREAS

	Gross Total ft²	Glass ft²	Glass (%)
Floor	4,848		
Part	0		
ExFlr	0		
Roof	1,933	0	0
Wall	4,498	3,075	68

HEATING COIL SELECTION

	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F
Main Htg	-120.0	0	0.0	0.0
Aux Htg	0.0	0	0.0	0.0
Preheat	-24.1	460	7.0	53.5
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
Total	-144.1			

Project Name: Sherrerd Hall
Dataset Name: F:\THESIS\CALCS\MECHANICAL\OFFICE23.TRC

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MONTHLY ENERGY CONSUMPTION

By PENN STATE UNIVERSITY

------- Monthly Energy Consumption -------

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 1	**Original**												
Electric													
On-Pk Cons. (kWh)	7,363	6,743	8,093	8,838	9,880	10,771	11,813	11,068	9,366	8,965	8,185	7,590	108,674
On-Pk Demand (kW)	11	11	12	21	30	41	40	29	17	13	12	11	41
Purchased Steam													
On-Pk Cons. (therms)	228	176	77	19	9	1	0	0	5	33	85	179	812
On-Pk Demand (therms/hr)	1	0	0	0	0	0	0	0	0	0	0	0	1
Water													
Cons. (1000gal)	6	6	9	13	17	23	27	26	17	13	10	7	174

Energy Consumption		
Building	93,264	Btu/(ft2-year)
Source	251,890	Btu/(ft2-year)
Floor Area	4,848	ft2

Environmental Impact Analysis	
CO2	No Data Available
SO2	No Data Available
NOX	No Data Available

Project Name: Sherrerd Hall
Dataset Name: F:\THESIS\CALCS\MECHANICAL\OFFICE23.TRC

MONTHLY ENERGY CONSUMPTION

By PENN STATE UNIVERSITY

------- Monthly Energy Consumption -------

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 2	**Modified**												
Electric													
On-Pk Cons. (kWh)	7,913	7,245	8,653	9,391	10,454	11,257	12,269	11,525	9,887	9,541	8,730	8,155	115,020
On-Pk Demand (kW)	11	11	12	22	32	43	42	30	17	13	13	11	43
Purchased Steam													
On-Pk Cons. (therms)	308	244	131	50	32	5	1	1	19	78	151	256	1,274
On-Pk Demand (therms/hr)	1	1	0	0	0	0	0	0	0	0	0	1	1
Water													
Cons. (1000gal)	9	8	11	15	20	25	30	27	19	15	12	10	201

Energy Consumption		
Building	107,253	Btu/(ft2-year)
Source	277,988	Btu/(ft2-year)
Floor Area	4,848	ft2

Environmental Impact Analysis	
CO2	No Data Available
SO2	No Data Available
NOX	No Data Available

MONTHLY ENERGY CONSUMPTION

By PENN STATE UNIVERSITY

------- Monthly Energy Consumption -------

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 3	**Modified with New Glass**												
Electric													
On-Pk Cons. (kWh)	7,215	6,608	7,940	8,692	9,728	10,642	11,693	10,950	9,221	8,807	8,029	7,437	106,961
On-Pk Demand (kW)	11	11	11	20	30	40	40	29	17	12	12	11	40
Purchased Steam													
On-Pk Cons. (therms)	200	152	60	9	2	0	0	0	0	19	64	153	658
On-Pk Demand (therms/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0
Water													
Cons. (1000gal)	6	6	8	13	16	22	27	25	17	12	9	7	167

Energy Consumption		
Building	88,883	Btu/(ft2-year)
Source	244,038	Btu/(ft2-year)
Floor Area	4,848	ft2

Environmental Impact Analysis	
CO2	No Data Available
SO2	No Data Available
NOX	No Data Available

System Checksums

By PENN STATE UNIVERSITY

System - 001 **VAV w/Baseboard Heating**

COOLING COIL PEAK

Peaked at Time: Mo/Hr: 8 / 17
Outside Air: OADB/WB/HR: 89 / 79 / 130

	Space Sens. + Lat. Btu/h	Plenum Sens. + Lat Btu/h	Net Total Btu/h	Percent Of Total (%)
Envelope Loads				
Skylite Solar	0	0	0	0
Skylite Cond	0	0	0	0
Roof Cond	0	0	0	0
Glass Solar	12,745	0	12,745	45
Glass Cond	647	0	647	2
Wall Cond	1,325	811	2,136	8
Partition	0		0	0
Floor	0		0	0
Adjacent Floor	0	0	0	0
Infiltration	1,832		1,832	6
Sub Total ==>	16,548	811	17,360	61
Internal Loads				
Lights	2,147	0	2,147	8
People	1,799	0	1,799	6
Misc	2,147	0	2,147	8
Sub Total ==>	6,093	0	6,093	21
Ceiling Load	118	-118	0	0
Ventilation Load	0	0	3,569	13
Adj Air Trans Heat	0		0	0
Dehumid. Ov Sizing			0	0
Ov/Undr Sizing	0		0	0
Exhaust Heat		-61	-61	0
Sup. Fan Heat			1,516	5
Ret. Fan Heat		0	0	0
Duct Heat Pkup		0	0	0
Underflr Sup Ht Pkup			0	0
Supply Air Leakage		0	0	0
Grand Total ==>	22,759	633	28,477	100.00

CLG SPACE PEAK

Mo/Hr: 9 / 16
OADB: 79

	Space Sensible Btu/h	Percent Of Total (%)
Envelope Loads		
Skylite Solar	0	0
Skylite Cond	0	0
Roof Cond	0	0
Glass Solar	14,317	68
Glass Cond	167	1
Wall Cond	1,177	6
Partition	0	0
Floor	0	0
Adjacent Floor	0	0
Infiltration	116	1
Sub Total ==>	15,776	75
Internal Loads		
Lights	2,147	10
People	1,000	5
Misc	2,147	10
Sub Total ==>	5,293	25
Ceiling Load	103	0
Ventilation Load	0	0
Adj Air Trans Heat	0	0
Exhaust Heat	0	0
Grand Total ==>	21,172	100.00

HEATING COIL PEAK

Mo/Hr: Heating Design
OADB: 7

	Space Peak Space Sens Btu/h	Coil Peak Tot Sens Btu/h	Percent Of Total (%)
Envelope Loads			
Skylite Solar	0	0	0.00
Skylite Cond	0	0	0.00
Roof Cond	0	0	0.00
Glass Solar	0	0	0.00
Glass Cond	-2,901	-2,901	45.00
Wall Cond	-1,044	-1,660	25.74
Partition	0	0	0.00
Floor	0	0	0.00
Adjacent Floor	0	0	0
Infiltration	-1,978	-1,978	30.67
Sub Total ==>	-5,923	-6,538	101.41
Internal Loads			
Lights	0	0	0.00
People	0	0	0.00
Misc	0	0	0.00
Sub Total ==>	0	0	0.00
Ceiling Load	-524	0	0.00
Ventilation Load	0	0	0.00
Adj Air Trans Heat	0	0	0
Ov/Undr Sizing	0	0	0.00
Exhaust Heat		91	-1.41
OA Preheat Diff.		0	0.00
RA Preheat Diff.		0	0.00
Additional Reheat		0	0.00
Underflr Sup Ht Pkup		0	0.00
Supply Air Leakage		0	0.00
Grand Total ==>	-6,448	-6,448	100.00

TEMPERATURES

	Cooling	Heating
SADB	55.0	70.0
Ra Plenum	75.7	67.1
Return	75.7	67.1
Ret/OA	76.5	7.0
Fn MtrTD	0.2	0.0
Fn BldTD	0.3	0.0
Fn Frict	1.0	0.0

AIRFLOWS

	Cooling	Heating
Diffuser	940	0
Terminal	940	0
Main Fan	940	0
Sec Fan	0	0
Nom Vent	54	0
AHU Vent	54	0
Infil	28	28
MinStop/Rh	0	0
Return	968	28
Exhaust	82	28
Rm Exh	0	0
Auxiliary	0	0
Leakage Dwn	0	0
Leakage Ups	0	0

ENGINEERING CKS

	Cooling	Heating
% OA	5.8	0.0
cfm/ft²	1.64	0.00
cfm/ton	396.14	
ft²/ton	240.95	
Btu/hr·ft²	49.80	-16.25
No. People	4	

COOLING COIL SELECTION

	Total Capacity ton	Total Capacity MBh	Sens Cap. MBh	Coil Airflow cfm	Enter DB °F	Enter WB °F	Enter HR gr/lb	Leave DB °F	Leave WB °F	Leave HR gr/lb
Main Clg	2.4	28.5	23.6	914	76.5	62.0	59.3	53.5	51.2	51.7
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	2.4	28.5								

AREAS

	Gross Total ft²	Glass ft²	Glass (%)
Floor	572		
Part	0		
ExFlr	0		
Roof	0	0	0
Wall	410	141	35

HEATING COIL SELECTION

	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F
Main Htg	-6.5	0	0.0	0.0
Aux Htg	0.0	0	0.0	0.0
Preheat	-2.9	54	7.0	53.5
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
Total	-9.3			

Project Name: Sherrerd Hall
Dataset Name: F:\THESIS\Calcs\Mechanical\GradBullpen.TRC

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Alternative - 1 System Checksums Report Page 1 of 3

System Checksums

By PENN STATE UNIVERSITY

System - 001 — **VAV w/Baseboard Heating**

COOLING COIL PEAK

Peaked at Time: Mo/Hr: 8 / 17
Outside Air: OADB/WB/HR: 89 / 79 / 130

	Space Sens. + Lat. Btu/h	Plenum Sens. + Lat Btu/h	Net Total Btu/h	Percent Of Total (%)
Envelope Loads				
Skylite Solar	0	0	0	0
Skylite Cond	0	0	0	0
Roof Cond	0	0	0	0
Glass Solar	20,216	0	20,216	56
Glass Cond	1,026	0	1,026	3
Wall Cond	662	813	1,475	4
Partition	0		0	0
Floor	0		0	0
Adjacent Floor	0	0	0	0
Infiltration	1,848		1,848	5
Sub Total ==>	23,751	813	24,564	68
Internal Loads				
Lights	2,147	0	2,147	6
People	1,799	0	1,799	5
Misc	2,147	0	2,147	6
Sub Total ==>	6,093	0	6,093	17
Ceiling Load	92	-92	0	0
Ventilation Load	0	0	3,600	10
Adj Air Trans Heat	0		0	0
Dehumid. Ov Sizing			0	0
Ov/Undr Sizing	0		0	0
Exhaust Heat		-47	-47	0
Sup. Fan Heat			2,043	6
Ret. Fan Heat		0	0	0
Duct Heat Pkup		0	0	0
Underflr Sup Ht Pkup			0	0
Supply Air Leakage		0	0	0
Grand Total ==>	29,936	674	36,253	100.00

CLG SPACE PEAK

Mo/Hr: 9 / 16
OADB: 79

	Space Sensible Btu/h	Percent Of Total (%)
Envelope Loads		
Skylite Solar	0	0
Skylite Cond	0	0
Roof Cond	0	0
Glass Solar	22,709	78
Glass Cond	265	1
Wall Cond	588	2
Partition	0	0
Floor	0	0
Adjacent Floor	0	0
Infiltration	116	0
Sub Total ==>	23,678	82
Internal Loads		
Lights	2,147	7
People	1,000	3
Misc	2,147	7
Sub Total ==>	5,293	18
Ceiling Load	79	0
Ventilation Load	0	0
Adj Air Trans Heat	0	0
Ov/Undr Sizing		
Exhaust Heat	0	0
OA Preheat Diff.		
RA Preheat Diff.		
Additional Reheat		
Underflr Sup Ht Pkup		
Supply Air Leakage		
Grand Total ==>	29,050	100.00

HEATING COIL PEAK

Mo/Hr: Heating Design
OADB: 7

	Space Peak Space Sens Btu/h	Coil Peak Tot Sens Btu/h	Percent Of Total (%)
Envelope Loads			
Skylite Solar	0	0	0.00
Skylite Cond	0	0	0.00
Roof Cond	0	0	0.00
Glass Solar	0	0	0.00
Glass Cond	-4,602	-4,602	60.35
Wall Cond	-522	-1,137	14.91
Partition	0	0	0.00
Floor	0	0	0.00
Adjacent Floor	0	0	0
Infiltration	-1,978	-1,978	25.93
Sub Total ==>	-7,102	-7,717	101.19
Internal Loads			
Lights	0	0	0.00
People	0	0	0.00
Misc	0	0	0.00
Sub Total ==>	0	0	0.00
Ceiling Load	-524	0	0.00
Ventilation Load	0	0	0.00
Adj Air Trans Heat	0	0	0
Ov/Undr Sizing	0	0	0.00
Exhaust Heat		91	-1.19
OA Preheat Diff.		0	0.00
RA Preheat Diff.		0	0.00
Additional Reheat		0	0.00
Underflr Sup Ht Pkup		0	0.00
Supply Air Leakage		0	0.00
Grand Total ==>	-7,626	-7,626	100.00

TEMPERATURES

	Cooling	Heating
SADB	55.0	70.0
Ra Plenum	75.5	67.1
Return	75.5	67.1
Ret/OA	76.1	7.0
Fn MtrTD	0.2	0.0
Fn BldTD	0.3	0.0
Fn Frict	1.0	0.0

AIRFLOWS

	Cooling	Heating
Diffuser	1,290	0
Terminal	1,290	0
Main Fan	1,290	0
Sec Fan	0	0
Nom Vent	54	0
AHU Vent	54	0
Infil	28	28
MinStop/Rh	0	0
Return	1,318	28
Exhaust	82	28
Rm Exh	0	0
Auxiliary	0	0
Leakage Dwn	0	0
Leakage Ups	0	0

ENGINEERING CKS

	Cooling	Heating
% OA	4.2	0.0
cfm/ft²	2.26	0.00
cfm/ton	426.97	
ft²/ton	189.27	
Btu/hr·ft²	63.40	-18.31
No. People	4	

COOLING COIL SELECTION

	Total Capacity ton	Total Capacity MBh	Sens Cap. MBh	Coil Airflow cfm	Enter DB °F	Enter WB °F	Enter HR gr/lb	Leave DB °F	Leave WB °F	Leave HR gr/lb
Main Clg	3.0	36.3	31.3	1,231	76.1	61.3	56.6	53.5	50.9	50.9
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	3.0	36.3								

AREAS

	Gross Total ft²	Glass ft²	Glass (%)
Floor	572		
Part	0		
ExFlr	0		
Roof	0	0	0
Wall	410	224	55

HEATING COIL SELECTION

	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F
Main Htg	-7.6	0	0.0	0.0
Aux Htg	0.0	0	0.0	0.0
Preheat	-2.9	54	7.0	53.5
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
Total	-10.5			

Project Name: Sherrerd Hall
Dataset Name: F:\THESIS\Calcs\Mechanical\GradBullpen.TRC

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System Checksums

By PENN STATE UNIVERSITY

System - 001 — **VAV w/Baseboard Heating**

COOLING COIL PEAK

Peaked at Time: Mo/Hr: 8 / 17
Outside Air: OADB/WB/HR: 89 / 79 / 130

	Space Sens. + Lat. Btu/h	Plenum Sens. + Lat Btu/h	Net Total Btu/h	Percent Of Total (%)
Envelope Loads				
Skylite Solar	0	0	0	0
Skylite Cond	0	0	0	0
Roof Cond	0	0	0	0
Glass Solar	13,753	0	13,753	47
Glass Cond	869	0	869	3
Wall Cond	662	812	1,474	5
Partition	0		0	0
Floor	0		0	0
Adjacent Floor	0	0	0	0
Infiltration	1,834		1,834	6
Sub Total ==>	17,119	812	17,931	62
Internal Loads				
Lights	2,147	0	2,147	7
People	1,799	0	1,799	6
Misc	2,147	0	2,147	7
Sub Total ==>	6,093	0	6,093	21
Ceiling Load	116	-116	0	0
Ventilation Load	0	0	3,572	12
Adj Air Trans Heat	0		0	0
Dehumid. Ov Sizing			0	0
Ov/Undr Sizing	0		0	0
Exhaust Heat		-59	-59	0
Sup. Fan Heat			1,558	5
Ret. Fan Heat		0	0	0
Duct Heat Pkup		0	0	0
Underflr Sup Ht Pkup			0	0
Supply Air Leakage		0	0	0
Grand Total ==>	23,328	637	29,094	100.00

CLG SPACE PEAK

Mo/Hr: 9 / 16
OADB: 79

	Space Sensible Btu/h	Percent Of Total (%)
Envelope Loads		
Skylite Solar	0	0
Skylite Cond	0	0
Roof Cond	0	0
Glass Solar	15,452	71
Glass Cond	224	1
Wall Cond	588	3
Partition	0	0
Floor	0	0
Adjacent Floor	0	0
Infiltration	116	1
Sub Total ==>	16,380	75
Internal Loads		
Lights	2,147	10
People	1,000	5
Misc	2,147	10
Sub Total ==>	5,293	24
Ceiling Load	100	0
Ventilation Load	0	0
Adj Air Trans Heat	0	0
Dehumid. Ov Sizing		
Ov/Undr Sizing	0	0
Exhaust Heat		
Sup. Fan Heat		
Ret. Fan Heat		
Duct Heat Pkup		
Underflr Sup Ht Pkup		
Supply Air Leakage		
Grand Total ==>	21,773	100.00

HEATING COIL PEAK

Mo/Hr: Heating Design
OADB: 7

	Space Peak Space Sens Btu/h	Coil Peak Tot Sens Btu/h	Percent Of Total (%)
Envelope Loads			
Skylite Solar	0	0	0.00
Skylite Cond	0	0	0.00
Roof Cond	0	0	0.00
Glass Solar	0	0	0.00
Glass Cond	-3,872	-3,872	56.15
Wall Cond	-522	-1,137	16.49
Partition	0	0	0.00
Floor	0	0	0.00
Adjacent Floor	0	0	0
Infiltration	-1,978	-1,978	28.68
Sub Total ==>	-6,372	-6,987	101.32
Internal Loads			
Lights	0	0	0.00
People	0	0	0.00
Misc	0	0	0.00
Sub Total ==>	0	0	0.00
Ceiling Load	-524	0	0.00
Ventilation Load	0	0	0.00
Adj Air Trans Heat	0	0	0
Ov/Undr Sizing	0	0	0.00
Exhaust Heat		91	-1.32
OA Preheat Diff.		0	0.00
RA Preheat Diff.		0	0.00
Additional Reheat		0	0.00
Underflr Sup Ht Pkup		0	0.00
Supply Air Leakage		0	0.00
Grand Total ==>	-6,896	-6,896	100.00

TEMPERATURES

	Cooling	Heating
SADB	55.0	70.0
Ra Plenum	75.6	67.1
Return	75.6	67.1
Ret/OA	76.4	7.0
Fn MtrTD	0.2	0.0
Fn BldTD	0.3	0.0
Fn Frict	1.0	0.0

AIRFLOWS

	Cooling	Heating
Diffuser	967	0
Terminal	967	0
Main Fan	967	0
Sec Fan	0	0
Nom Vent	54	0
AHU Vent	54	0
Infil	28	28
MinStop/Rh	0	0
Return	995	28
Exhaust	82	28
Rm Exh	0	0
Auxiliary	0	0
Leakage Dwn	0	0
Leakage Ups	0	0

ENGINEERING CKS

	Cooling	Heating
% OA	5.6	0.0
cfm/ft²	1.69	0.00
cfm/ton	398.76	
ft²/ton	235.84	
Btu/hr·ft²	50.88	-17.04
No. People	4	

COOLING COIL SELECTION

	Total Capacity ton	Total Capacity MBh	Sens Cap. MBh	Coil Airflow cfm	Enter DB °F	Enter WB °F	Enter HR gr/lb	Leave DB °F	Leave WB °F	Leave HR gr/lb
Main Clg	2.4	29.1	24.2	939	76.4	61.9	59.0	53.5	51.1	51.6
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	2.4	29.1								

AREAS

	Gross Total ft²	Glass ft²	Glass (%)
Floor	572		
Part	0		
ExFlr	0		
Roof	0	0	0
Wall	410	224	55

HEATING COIL SELECTION

	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F
Main Htg	-6.9	0	0.0	0.0
Aux Htg	0.0	0	0.0	0.0
Preheat	-2.9	54	7.0	53.5
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
Total	-9.7			

Project Name: Sherrerd Hall
Dataset Name: F:\THESIS\Calcs\Mechanical\GradBullpen.TRC

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MONTHLY ENERGY CONSUMPTION

By PENN STATE UNIVERSITY

------- Monthly Energy Consumption -------

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 1	**Original**												
Electric													
On-Pk Cons. (kWh)	1,641	1,726	2,684	2,908	3,044	3,067	3,613	3,439	2,953	3,409	2,564	2,229	33,279
On-Pk Demand (kW)	14	17	19	18	15	16	19	23	25	24	17	12	25
Purchased Steam													
On-Pk Cons. (therms)	1	0	0	0	0	0	0	0	0	0	0	0	1
On-Pk Demand (therms/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0
Water													
Cons. (1000gal)	1	1	1	2	2	2	3	3	2	2	1	1	20

Energy Consumption		
Building	198,849	Btu/(ft2-year)
Source	596,256	Btu/(ft2-year)
Floor Area	572	ft2

Environmental Impact Analysis	
CO2	No Data Available
SO2	No Data Available
NOX	No Data Available

Project Name: Sherrerd Hall
Dataset Name: F:\THESIS\Calcs\Mechanical\GradBullpen.TRC

TRACE® 700 v6.2 calculated at 05:52 PM on 04/04/2010
Alternative - 1 Monthly Energy Consumption report Page 1 of 3

MONTHLY ENERGY CONSUMPTION

By PENN STATE UNIVERSITY

------- Monthly Energy Consumption -------

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 2	**Modified**												
Electric													
On-Pk Cons. (kWh)	1,476	1,387	2,540	2,760	2,895	2,937	3,471	3,317	2,835	3,262	2,397	1,692	30,968
On-Pk Demand (kW)	15	19	21	18	14	15	18	22	25	25	18	13	25
Purchased Steam													
On-Pk Cons. (therms)	5	2	0	0	0	0	0	0	0	0	0	1	7
On-Pk Demand (therms/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0
Water													
Cons. (1000gal)	1	1	1	2	2	3	3	3	2	2	1	1	23

Energy Consumption		
Building	186,093	Btu/(ft2-year)
Source	556,256	Btu/(ft2-year)
Floor Area	572	ft2

Environmental Impact Analysis	
CO2	No Data Available
SO2	No Data Available
NOX	No Data Available

MONTHLY ENERGY CONSUMPTION

By PENN STATE UNIVERSITY

------- Monthly Energy Consumption -------

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 3	**Modified with New Glass**												
Electric													
On-Pk Cons. (kWh)	1,553	1,526	2,642	2,883	3,028	3,070	3,631	3,446	2,956	3,399	2,522	2,069	32,726
On-Pk Demand (kW)	13	16	19	17	15	16	19	23	25	24	17	12	25
Purchased Steam													
On-Pk Cons. (therms)	2	1	0	0	0	0	0	0	0	0	0	0	3
On-Pk Demand (therms/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0
Water													
Cons. (1000gal)	1	1	1	2	2	2	3	3	2	2	1	1	20

Energy Consumption		Environmental Impact Analysis	
Building	195,862 Btu/(ft2-year)	CO2	No Data Available
Source	586,774 Btu/(ft2-year)	SO2	No Data Available
		NOX	No Data Available
Floor Area	572 ft2		

ACADEMIC VITA of Jamie Rose Devenger

Jamie Rose Devenger
117 West Nittany Avenue, Apt. 2
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jrd5035@psu.edu

Education: Integrated Bachelor and Master of Architectural Engineering, Penn State University, Spring 2010
Honors in Architectural Engineering
Thesis Title: A Study of the Engineering Systems in Sherrerd Hall at Princeton University and a Redesign of Several Systems, Emphasis on Lighting and Electrical Design
Thesis Supervisor: Richard Mistrick

Related Experience:
Internship with Fisher Marantz Stone (an architectural lighting design firm in New York, NY)
Supervisor: Margo Wiltshire
Summer 2009

Awards:
Evan Pugh Award
President's Freshman Award
Dean's List
Leonhard Scholar
Architectural Engineering Fourth Year Architecture Studio Top Design
John Flynn Memorial Award

Presentations/Activities:
President of Student Chapter of the Illuminating Engineering Society
Penn State Solar Decathlon Lighting Design Team