



Joseph Lookup  
Senior Thesis 2005  
Wegmans Fairfax

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# Appendix-1

## (Lighting)



Joseph Lookup  
Senior Thesis 2005  
Wegmans Fairfax

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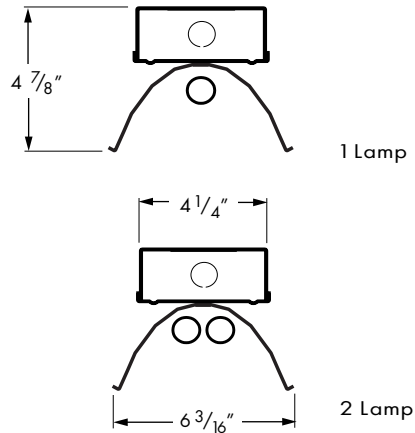
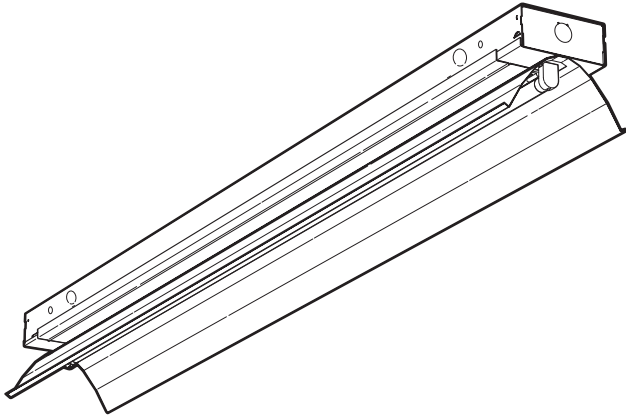
# Appendix-1.2

# T5 AISLE LIGHTER

LUMINAIRE F2

SERIES  
VOLTAGE TYPE JOB

88  
T5



## SPECIFICATIONS

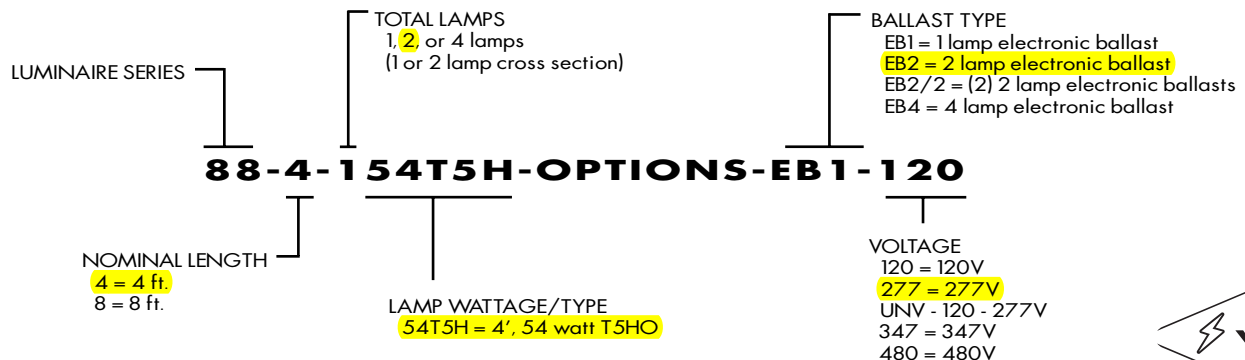
- HOUSING – 22 Ga. die formed C.R.S.
- REFLECTIVE SURFACES – highly specular anodized MIRO 4™ aluminum reflector
- FINISH – white powder coating with 5-stage iron/phosphate prepared metal. 92% minimum average reflectance
- ELECTRICAL – electronic ballast standard, T5 HO, programmed start, rated class P
- LABELS – UL & CUL listed as fluorescent luminaire suitable for dry or damp locations.
- MOUNTING – Surface or suspended mount

## FEATURES

- Reflector design provides a narrow distribution for efficient illumination of aisles
- T5HO lamps maintain 95% of their original output and provide good color rendition
- Mounting options include stem, chain, or surface
- Factory mounted, pre-wired sockets cut installation time
- Hinging/locking lamp brackets cut installation time
- All parts painted after fabrication to facilitate installation, increase efficiency, and inhibit rusting
- End K.O.'s provide occupancy sensor placement – nothing saves energy like lights out!

## SUBMITTAL INFORMATION

For more options, accessories, and product details, refer to Information Section

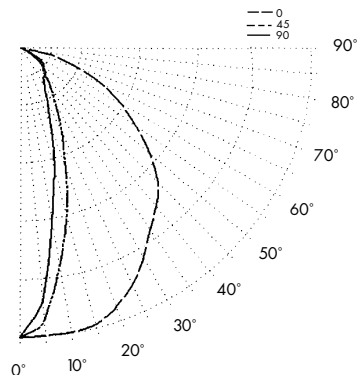


Williams Catalog #88-4-154T5H-EB1-120  
Test Report #11970.3, Dated 06/20/03

Lamp Type: FP54T5HO/835  
Lamp Quantity: 1

**CANDLEPOWER DISTRIBUTION**

VERT. ANG.	HORIZONTAL ANGLE			ZONAL LUMENS
	0	45	90	
0	4671.	4671.	4671.	
5	4653.	4414.	4085.	419.4
15	4600.	2816.	2065.	873.4
25	4204.	1521.	996.	916.8
35	3590.	833.	614.	818.1
45	3075.	488.	548.	724.2
55	2235.	418.	235.	549.5
65	1418.	116.	3.	265.9
75	591.	3.	0.	101.7
85	46.	0.	0.	8.7
90	0.	0.	0.	



**LUMEN SUMMARY**

ZONE	LUMENS	% LAMP	% FIXTURE
0 - 30	2210.	44.2	47.2
0 - 40	3028.	60.6	64.7
0 - 60	4301.	86.0	92.0
0 - 90	4678.	93.6	100.0
90 - 120	0.	0.0	0.0
90 - 130	0.	0.0	0.0
90 - 150	0.	0.0	0.0
90 - 180	0.	0.0	0.0
0 - 180	4678.	93.6	100.0

**ZONAL CAVITY COEFFICIENTS**

EFFECTIVE FLOOR CAVITY REFL. = .20

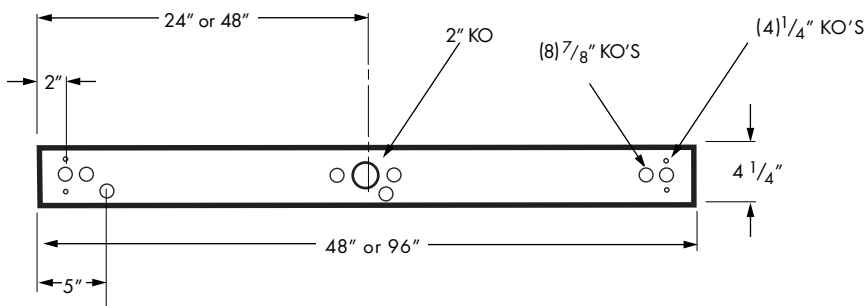
WALL RCR	.80			.70			.50		
	.70	.50	.30	.70	.50	.30	.50	.30	.10
0	111	111	111	109	109	109	104	104	104
1	105	102	99	103	100	97	96	94	92
2	98	93	88	96	91	87	88	84	81
3	92	85	79	90	83	78	81	76	73
4	86	77	71	84	76	70	74	69	65
5	80	70	64	78	69	63	68	62	58
6	75	65	58	73	64	58	62	57	53
7	70	60	53	69	59	52	58	52	48
8	65	55	48	64	54	48	53	47	43
9	61	50	44	59	50	43	49	43	39
10	57	46	40	54	46	40	45	39	35

**TOTAL LUMINAIRE**

OPTICAL EFFICIENCY = 93.6%

SPACING CRITERIA: END = 1.2 DIAG. = 0.6 ACROSS = 0.4

**BACK VIEW**







**Product Number:** 20858

**LAMP F2**

**Order Abbreviation:** FP54/835/HO

**General Description:** 54W, T5 PENTRON high output (HO) fluorescent lamp, 3500K color temperature, rare earth phosphor, 82 CRI

Product Information	
Abbrev. With Packaging Info.	FP54835HO 40/CS 1/SKU
Actual Length (in)	45.8
Actual Length (mm)	1163.2
Average Rated Life (hr)	20000
Base	Miniature Bipin
Bulb	T5
Color Rendering Index (CRI)	82
Color Temperature/CCT (K)	3500
Diameter (in)	0.67
Diameter (mm)	17.0
Family Brand Name	Pentron®
Initial Lumens at 25C	4450
Initial Lumens at 35C	5000
Mean Lumens at 25C	4138
Mean Lumens at 35C	4650
Nominal Length (in)	48
Nominal Wattage (W)	54.00

Additional Product Information
<a href="#">Product Documents, Graphs, and Images</a>
<a href="#">Compatible Ballast</a>
<a href="#">Packaging Information</a>



Footnotes
<ul style="list-style-type: none"> <li>• Approximate initial lumens after 100 hours operation.</li> <li>• The life ratings of fluorescent lamps are based on 3 hr. burning cycles under specified conditions and with ballast meeting ANSI specifications. If burning cycle is increased, there will be a corresponding increase in the average hours life.</li> </ul>



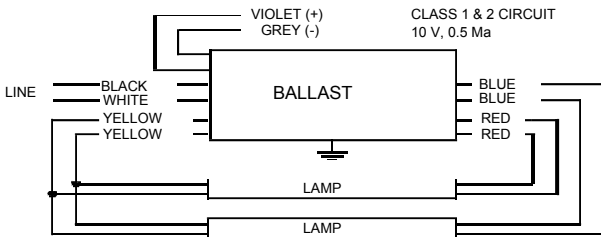
**BALLAST: F2**

<b>RZT-2S54</b>	
Brand Name	MARK VII 0-10V
Ballast Type	Electronic Dimming
Starting Method	Programmed Start
Lamp Connection	Series
Input Voltage	120
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 (Watts) (min/max)	Ballast Factor (min/max)	MAX THD %	Power Factor	Lamp Current Crest Factor	B.E.F.
* F54T5/HO	2	54	50/10	1.05	24/125	0.03/1.00	10	0.98	1.7	0.80
FC12T5/HO	2	55	50/10	0.96	24/114	0.03/0.90	10	0.98	1.7	0.79
FT55W/2G11	2	55	50/10	0.96	24/114	0.03/0.90	10	0.98	1.7	0.79

**Wiring Diagram**



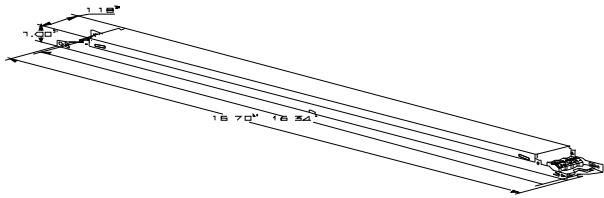
Diag. 56

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

**Standard Lead Length (inches)**

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

**Enclosure**



**Enclosure Dimensions**

OverAll (L)	Width (W)	Height (H)	Mounting (M)
16.70 "	1.18 "	1.00 "	16.34 "
16 7/10	1 9/50	1	16 17/50
42.4 cm	3 cm	2.5 cm	41.5 cm

Revised 12/28/2001



Data is based upon tests performed by Advance Transformer in a controlled environment and 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.

**ADVANCE TRANSFORMER CO.**

O'HARE INTERNATIONAL CENTER · 10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018  
 Customer Support/Technical Service: Phone: 800-372-3331 · Fax: 630-307-3071  
 Corporate Offices: Phone: 800-322-2086



<b>RZT-2S54</b>	
Brand Name	MARK VII 0-10V
Ballast Type	Electronic Dimming
Starting Method	Programmed Start
Lamp Connection	Series
Input Voltage	120
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 or integral leads color coded per ANSI C82.11.

#### Section II - Performance Requirements

- 2.1 Ballast shall be Programmed Start.
- 2.2 Ballast shall be provided with integral protection circuitry to withstand connection of low voltage control leads to mains power supply. In this event, ballast shall default to maximum light output.
- 2.3 Ballast shall contain auto restart circuitry in order to restart lamps without resetting power.
- 2.4 Ballast shall operate from 50/60 Hz input source of 120V or 277V with sustained variations of +/- 10% (voltage and frequency) with no damage to the ballast. IntelliVolt models 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 ballast.
- 2.5 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.
- 2.6 Ballast shall have a Power Factor greater than 0.98 at full light output and greater than 0.90 throughout the dimming range for primary lamp.
- 2.7 Ballast shall have a maximum ballast factor of 1.00 (1.18 for HL versions) at maximum light output and 0.03 at minimum light output for primary lamp application.
- 2.8 Ballast shall provide for a Lamp Current Crest Factor of 1.7 or less throughout the dimming range in accordance with lamp manufacturer recommendations.
- 2.9 Ballast input current shall have Total Harmonic Distortion (THD) of less than 10% when operated at nominal line voltage with primary lamp.
- 2.10 Ballast shall have a Class A sound rating.
- 2.11 Ballast shall have a minimum starting temperature of 10C (50F) for primary lamp.
- 2.12 Ballast shall provide Lamp EOL Protection Circuit for all T5, T5/HO, CFL lamps, and T8 lamps operating on 4-lamp ballast.
- 2.13 Ballast shall control lamp light output from 100% - 3% relative light output for T8 and CFL lamps and 100% - 1% relative light output for T5/HO lamps.
- 2.14 Ballast shall ignite the lamps at any light output setting without first going to another output setting.
- 2.15 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 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).

#### Section IV - Other

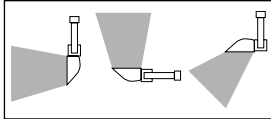
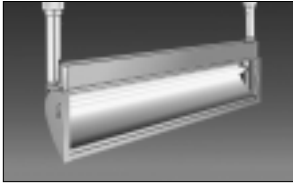
- 4.1 Ballast shall be manufactured in a factory certified to ISO 9002 Quality System Standards.
- 4.2 Ballast shall carry a five-year warranty from date of manufacture against defects in material or workmanship, including replacement, for operation at a maximum case temperature of 70C.

# Arcade

## Fluorescent (1) 14w T5 or 24w T5 HO

## 2' Track Wallwasher T5

LUMINAIRE F3



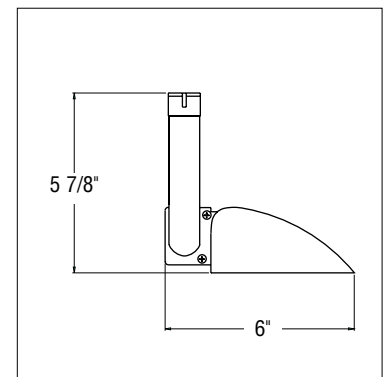
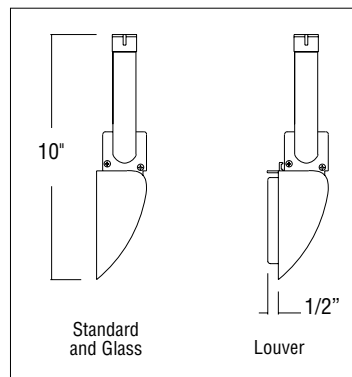
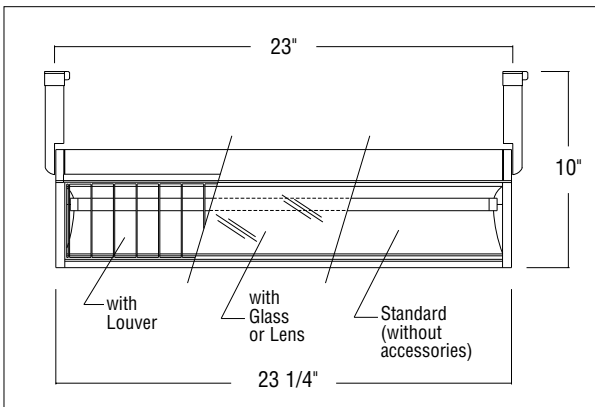
**Applications:** An energy efficient track-mounted wallwasher for corporate offices, retail stores and institutional needs such as corridors and displays. May be used in 2 positions for wallwashing. Wall-mounted version is available (on canopy mounts, supplied) for uplighting.

Type: \_\_\_\_\_

Project: \_\_\_\_\_

ORDERING NOTE: Fixture supplied as complete unit. Indicate adapter, wattage, finish and accessories.

▼ Fixture Series	▼ Adapter	▼ Wattage	▼ Finish	▼ Accessories
<b>942</b>	_____	_____	_____	_____
<b>942</b> 2' Wallwasher 14w T5 or 24w T5 HO	<b>1</b> 1-Circuit (1-C) <b>3</b> 3-Circuit (3-C) <b>6</b> 1-Circuit (1-C) For use with ZX** <b>7</b> 1-Circuit (1-C) For use with RTX* <b>0</b> Wall Mounted with canopy (wall mounted unit supplied with white canopies, (available in white only) not track adapters)	<b>14</b> 14 watt T5 Fluorescent  <b>24</b> 24 watt T5 HO Fluorescent	<b>TN</b> Titan (Satin Aluminum)* <b>WH</b> Matte White**  ** 9426 is white * 9427 is titan	<b>52915</b> Glass Guard <b>55228</b> UV Lens <b>52915FL</b> Frosted Lens <b>7002930</b> Black Louver



For ZX or RTX mounting and wall-mounted see back.



IBEW Union Made

**1. Track Adapter** - Die-cast adapter with spring-loaded, silver soldered contacts ensures rigid electrical and mechanical connection. Three circuit selector is concealed within the adapter's head with labeled snap-lock positions for positive

circuit selection (see Track Systems Components spec sheets or the Track Catalog, Volume 2 of Zumtobel Staff binder for additional information). Finish of track adapter is black for black and titan fixtures, white for white fixtures. Track adapters rotate independently enabling universal mounting orientation.

**2. Double Arm** - Die-cast arms for secure fastening to track. Arms allows for 90° tilt in both directions.

**3. Housing** - Extruded aluminum housing, held in place by die-cast aluminum end caps.

**4. Reflector** - Aluminum, with a satin anodized finish. Reflector provides asymmetric distribution.

**5. Paint Finish** - Baked enamel.

**6. Ballast** - Electronic, 120 volt for T5 lamp.

**7. Lamp** - One 14w T5 or 24w T5 HO (high output) fluorescent lamp. Miniature bi-pin base, supplied by others. Thermoplastic sockets with rotors for secure lamp retention. G5 bi-pin base.

**8. Optional Accessories** - Glass guard (clear, flat glass), UV lens (clear, flat UV filtering glass), or frosted lens or louver. Note: black

painted steel louver cannot be used in combination with glass accessories.

**9. Weight** - 4.0 lbs.

**ARCADE track fixtures can also be used with Zumtobel Staff's ZX or RTX linear fluorescent systems. For more information, consult Volume 1 of your Zumtobel Staff Lighting binder, or call 1-800-932-0633 to request a ZX or RTX system catalog.**

In a continuing effort to offer the best product possible we reserve the right to change, without notice, specifications or materials that in our opinion will not alter the function of the product.

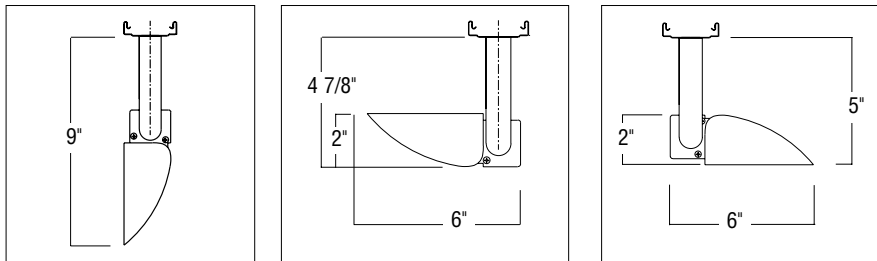
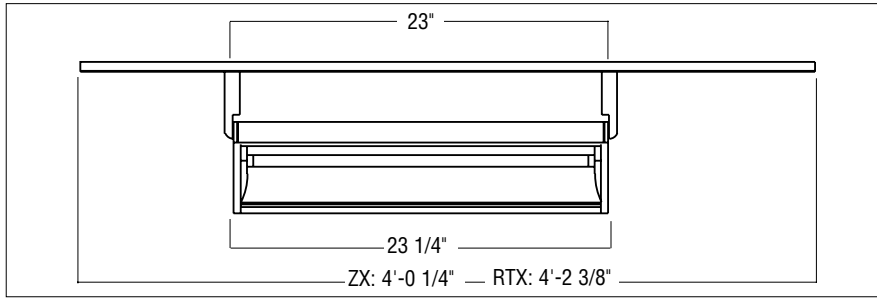
Zumtobel Staff Lighting Inc. ©2000  
 3300 Route 9W  
 Highland, NY 12528-2630  
 TEL (845) 691-6262 • (800) 932-0633 • FAX (845) 691-6289  
 89 00151 9/00

# Arcade Fluorescent (1) 14w T5 or 24w T5 HO

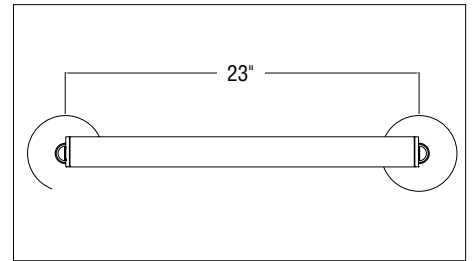
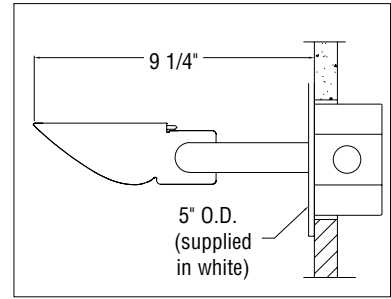
# 2' Track Wallwasher

# T5

## ZX or RTX Mounting



## Wall-Mounted



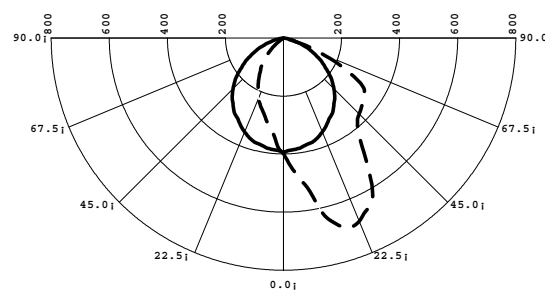
## Photometric Data

### 942 (1) 14W T5

2' FLUORESCENT TRACK WALLWASHER

Total Luminaire Efficiency 80%  
 0% Uplight 100% Downlight  
 Spacing Criteria  
 Lateral Plane 0 90  
 1.6 1.2  
 TOTAL LAMP LUMENS = 1350  
 INPUT WATTS = 16

### Candela Distribution



Vertical Angle	Horizontal Angle					Zonal Lumens
	0	45	90	135	180	
0	396	396	396	396	396	
5	466	434	386	361	346	35.6
15	656	538	373	289	267	118.1
25	663	643	340	236	207	188.7
35	486	585	300	178	139	217.6
45	369	403	246	118	78	200.5
55	338	280	177	56	9	165.7
65	204	230	107	4	0	107.4
75	18	66	43	0	0	35.7
85	0	0	4	0	0	2.0
90	0	0	0	0	0	

### Wallwash Lighting Data Chart

		4'				6'				
Wall	Ceiling	0'	1.5'	2.5'	4'	0'	1.5'	3'	4.5'	6'
			1'	46	44	44	46	42	31	22
	2'	49	47	47	49	44	34	25	34	44
	3'	22	23	23	22	19	17	14	17	19
	4'	12	13	13	12	10	10	9	10	10
	5'	8	8	8	8	6	6	6	6	6
	6'	4	5	5	4	4	4	4	4	4
	7'	2	2	2	2	2	2	2	2	2
	8'	1	1	1	1	1	1	1	1	1
	9'	1	1	1	1	1	1	1	1	1
	Floor	0	0	0	0	0	0	0	0	0
	Maximum	= 49				= 44				
	Average	= 14				= 11				
	Minimum	= 0				= 0				

LAMP F3

**General**

<u>Product Code</u>	31590
<u>Description</u>	F14W/T5/830/ECO
<u>Subcategory</u>	T5 Starcoat High Efficiency

**Physical**

<u>Bulb Type</u>	T5
<u>Base Type</u>	Miniature BiPin (G5)
<u>Nominal Length (In.)</u>	21.60
<u>Nominal Length (mm)</u>	550
<u>Max Overall Length (In.)</u>	22.173
<u>Bulb Nominal Diameter in inches</u>	.625

**Photometric**

<u>Lumens (Initial)</u>	1350
<u>Lumens (Mean)</u>	1269
<u>Color Temperature (K)</u>	3000

**Electrical**

<u>Average Rated Life</u>	20000
<u>Watts</u>	14
<u>Nominal Lamp Volts</u>	82
<u>Minimum Starting Temp (deg F)</u>	5

**Miscellaneous**

<u>Additional Information</u>	S/P Ratio: 1.3 Lumen Ratings at 35C. At 25C, Initial Lumens are 1230.
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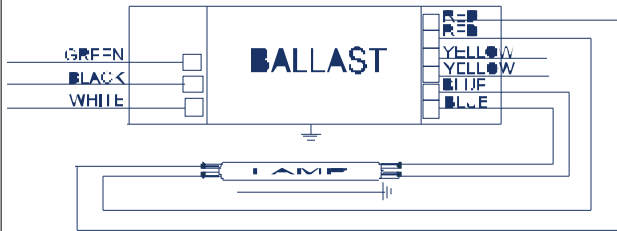
## ICN-2S28@277

Brand Name	CENTIUM T5
Ballast Type	Electronic
Starting Method	Programmed Start
Lamp Connection	Series
Input Voltage	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	0.07	19	1.07	20	0.90	1.7	5.63
F14T5	2	14	0/-18	0.13	34	1.06	10	0.98	1.7	3.12
F21T5	1	21	0/-18	0.10	26	1.03	15	0.95	1.7	3.96
F21T5	2	21	0/-18	0.17	48	1.02	10	0.98	1.7	2.13
F28T5	1	28	0/-18	0.12	33	1.04	10	0.98	1.7	3.15
F28T5	2	28	0/-18	0.23	63	1.03	10	0.99	1.7	1.63
F35T5	1	35	0/-18	0.15	41	1.01	10	0.98	1.7	2.46
F35T5	2	35	0/-18	0.28	77	1.00	10	0.99	1.7	1.30

### Wiring Diagram



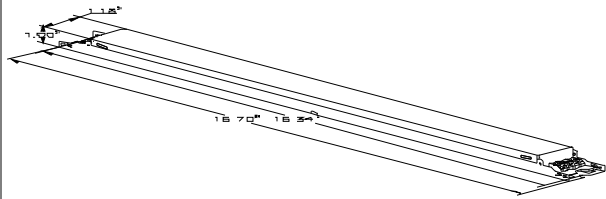
For 1 lamp operation, do not use yellow leads

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

### Standard Lead Length (inches)

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

### Enclosure



### Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
16.70 "	1.18 "	1.00 "	16.34 "
16 7/10	1 9/50	1	16 17/50
42.4 cm	3 cm	2.5 cm	41.5 cm

Revised 09/01/2004



Data is based upon tests performed by Advance Transformer in a controlled environment and 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.

### ADVANCE TRANSFORMER CO.

O'HARE INTERNATIONAL CENTER · 10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018

Customer Support/Technical Service: Phone: 800-372-3331 · Fax: 630-307-3071

Corporate Offices: Phone: 800-322-2086



<b>ICN-2S28@277</b>	
Brand Name	CENTIUM T5
Ballast Type	Electronic
Starting Method	Programmed Start
Lamp Connection	Series
Input Voltage	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 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) 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.
- 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.

#### 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).

#### 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.
- 4.4 Ballast shall be Advance Transformer part # \_\_\_\_\_ or approved equal.

Revised 09/01/2004



Data is based upon tests performed by Advance Transformer in a controlled environment and 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.

**ADVANCE TRANSFORMER CO.**  
 O'HARE INTERNATIONAL CENTER - 10275 WEST HIGGINS ROAD  
 ROSEMONT, ILLINOIS 60018  
 TELEPHONE: (847) 390-5000 FAX: (847) 390-5109



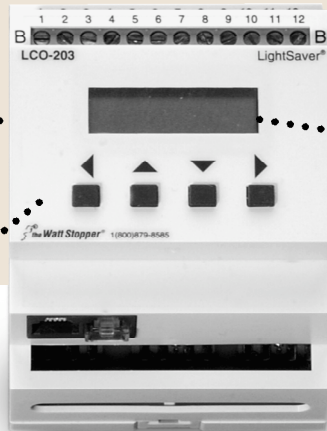


# LightSaver® LCO-203 ON/OFF Switching

Automatic ON/OFF daylighting control module

Multi-level switching

Pushbutton programming and automated setup



Five individually programmable adjustments for each control channel

LCD display of light level readings

Open loop control

PROJECT
LOCATION/TYPE

## Product Overview

### Description

The Watt Stopper LightSaver LCO-203 provides automatic ON/OFF switching control for fluorescent and HID fixtures. It is an open loop controller providing up to three zones of control from a single photocell.

### Operation

The LCO controller is part of a system that includes the LS-290C photocell and the BT-203 Power Pack. Each of the LCO controller's three channels connects directly with its own dedicated relay in the power pack. The photocell measures daylight and transmits these data to the LCO controller. When daylight is adequate, the LCO controller switches lighting off. When daylight diminishes below the desired setpoint, the LCO controller switches lighting back on. The ON and OFF delays for each channel are individually adjustable. The LCO controller integrates with occupancy sensors as well as an optional wall switch for manual overrides.

### Multiple Channel Control

Multi-channel control enables gradual, multi-level switching of electric lighting as the daylight contribution increases. The LCO can be used to either switch off individual rows of lamps in a luminaire or entire luminaires. This gradual reduction is likely to provide more balanced lighting while being less distracting to occupants.

### Applications

Spaces such as warehouses, storage areas, atriums, lobbies, and open office areas will benefit from use of the LCO controller.

## Features

- Simplified setup and calibration
- Optional wall switch (LS-4C) provides ON/OFF control so users can adjust lighting
- Five individually adjustable parameters for each channel: ON delay, OFF delay, deadband, setpoint, load shed setpoint
- Menu-driven, pushbutton programming without special tools
- Automatic internal calculation of daylight contribution for each channel for simplified setup
- DIN rail mounting
- Suitable for mounting in low voltage section in control panel
- California Title 24-2005 compliant



www.wattstopper.com  
800.879.8585



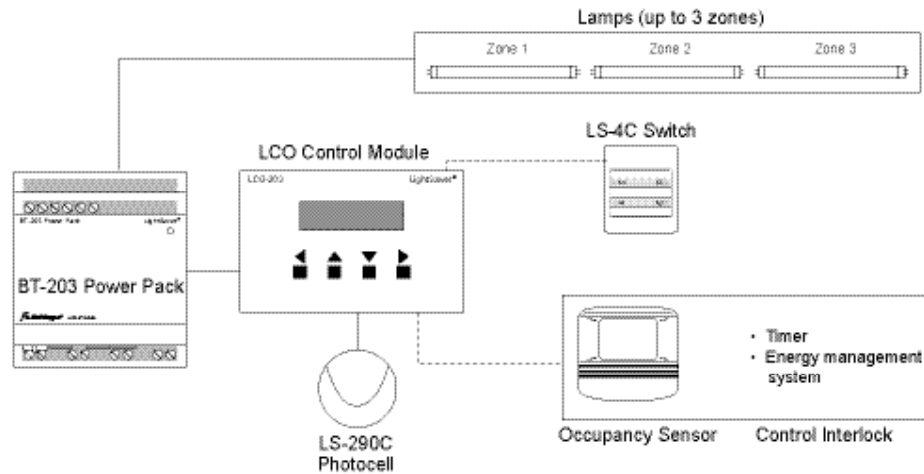
# LCO-203 Technical Information

## Specifications

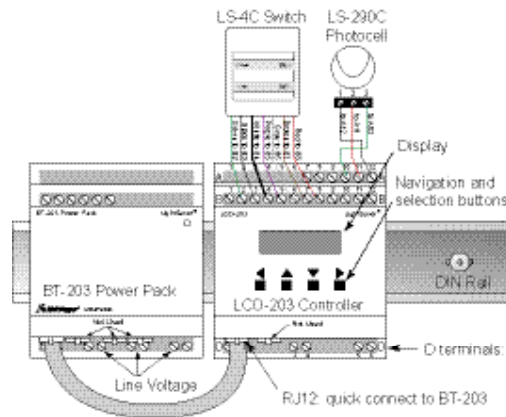
- Class 2 low voltage device
- Photocell range from 3 - 6,000 footcandles (32 - 64,000 lux)
- Setpoint range from 5-60 fc
- Programmable deadband from 10%-80%
- Adjustable ON delay from 5-60 seconds
- Adjustable OFF delay from 3-60 minutes
- Load shed setpoint from 5-60 fc
- 24VDC supply voltage provided by BT-203
- Dimensions: 3.5" x 2.81" x 2.5" (89mm x 71mm x 64mm) LxWxD
- UL and CUL listed; five year warranty

## System Layout & Wiring

### System Layout



### LCO-203 Wiring and Settings



## Ordering Information

Catalog No.	Description	Voltage	Channels
LCO-203	ON/OFF switching control module	24 VDC	three
LS-290c	Photocell		
BT-203	Power Pack		
<b>ON/OFF control system options:</b>			
Product group	Catalog No.	Description	
Switch	LS-4C	Wall Switch	
Enclosure	LS-E8	Screw-cover enclosure 8" x 8" x 4" (203.2mm x 203.2mm x 101.6mm)	
	LS-E12	Screw-cover enclosure 12" x 12" x 4" (304.8mm x 308.8mm x 101.6mm)	



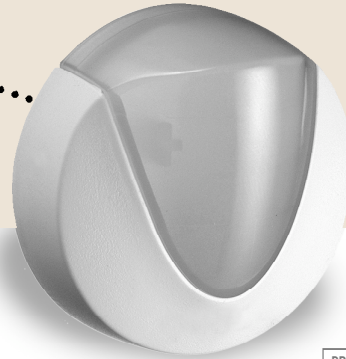
# LightSaver® LS-290C Photocell

Photocell for LightSaver LCD-203 and LCO-203 controllers

Mounts vertically or horizontally

Footcandle range from 3 - 6000

Architecturally attractive design



PROJECT
LOCATION/TYPE

## Product Overview

### Description

The Watt Stopper LightSaver LS-290C photocell provides the daylight data necessary for operation of the LCD-203 and LCO-203 daylighting control systems.

### Operation

Utilizing a photodiode element, the LS-290C continuously measures ambient light levels. The sensor is positioned to "see" incoming daylight from either a window or skylight without seeing electrical light. Users select the applicable footcandle range by a jumper beneath the front cover.

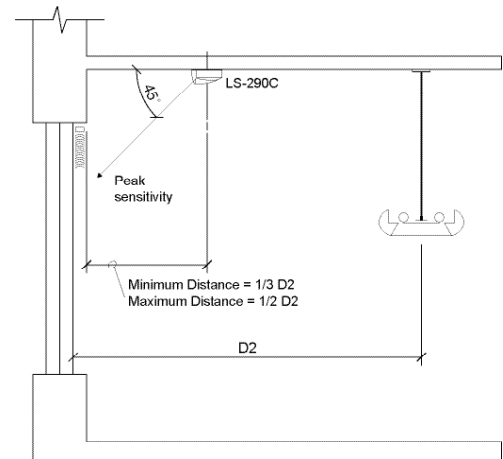
### Specifications

- Three jumper-selectable footcandle ranges: 3-300 fc, 30-3000 fc, 60-6000 fc
- Protective hard plastic cover
- 3 conductor 22 AWG twisted cable equal to Belden 8443
- Maximum wire length is 250 feet (76.2m)
- Low voltage, Class 2 device
- Dimensions: 2" diameter x 1.2" deep (50.8mm diameter x 30.5mm deep)
- UL and CUL listed, five year warranty

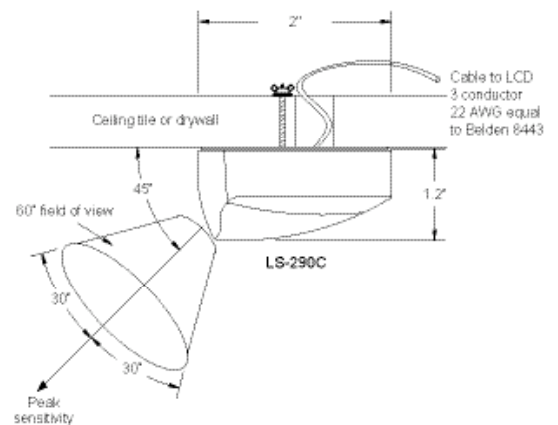
### Ordering Information

Catalog No.	Description	Footcandle range
LS-290C	Photocell	3 - 6000 (32 - 64,000 lux)

### Photocell Placement



### Installation and Wiring



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800.879.8585

Pub. No. 9605



# LightSaver® BT-203 Power Pack

Power pack for LightSaver LCO-203 and LCD-203 controllers

Three relays

Fully self-contained transformer



Quick connect to LCD-203 and LCO-203 control modules

DIN rail mount

PROJECT
LOCATION/TYPE

## Product Overview

### Description

The Watt Stopper LightSaver BT-203 Power Pack powers the LightSaver LCO-203 and LCD-203 control modules.

### Specifications

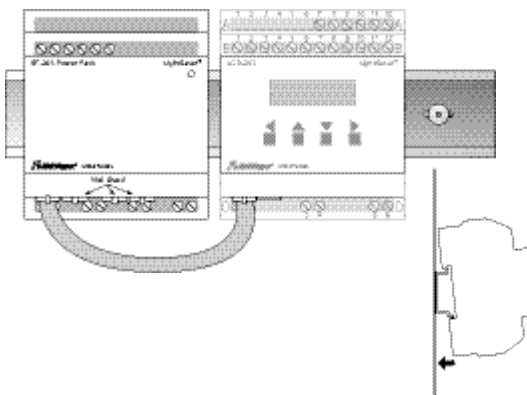
- Voltages: 100 - 277 VAC, 50/60 Hz
- Secondary power: 1 amp @ 24 VDC
- 3 normally open relays, 620 Va @ 120 or 277 VAC
- Dimensions: 2.76" x 3.57" x 2.36" (70.0mm x 90.5mm x 60.0mm) LxWxD
- UL and CUL listed, five year warranty

### Operation

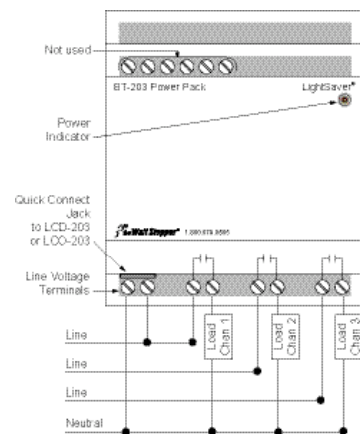
The BT-203 supplies low voltage power to LCO and LCD controllers. It connects via a quick connect cable. It has three normally open relays used to switch line voltage in response to signals from the connected controller. In addition, the power pack has an automatically resetting fuse. If the current drawn from the BT-203 exceeds the specifications, the +24VDC output will turn off and the LED will turn off. Upon removal of the fault condition and primary power, the BT-203 will restore the power.

## Wiring & Mounting

### Mounting



### Wiring



Catalog No.	Description	Input Voltage	Output
BT-203	Power Pack	100 - 277 VAC, 50/60 Hz	1 A @ 24 VDC

Pub. No. 9804

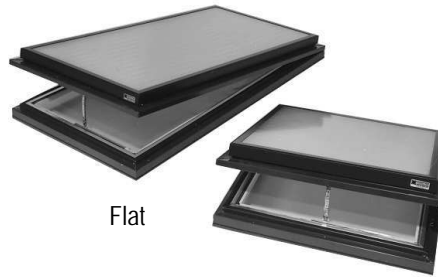


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# CoolOptics

## Flat Style CoolOptics

### Venting Skylights with Thermal Break

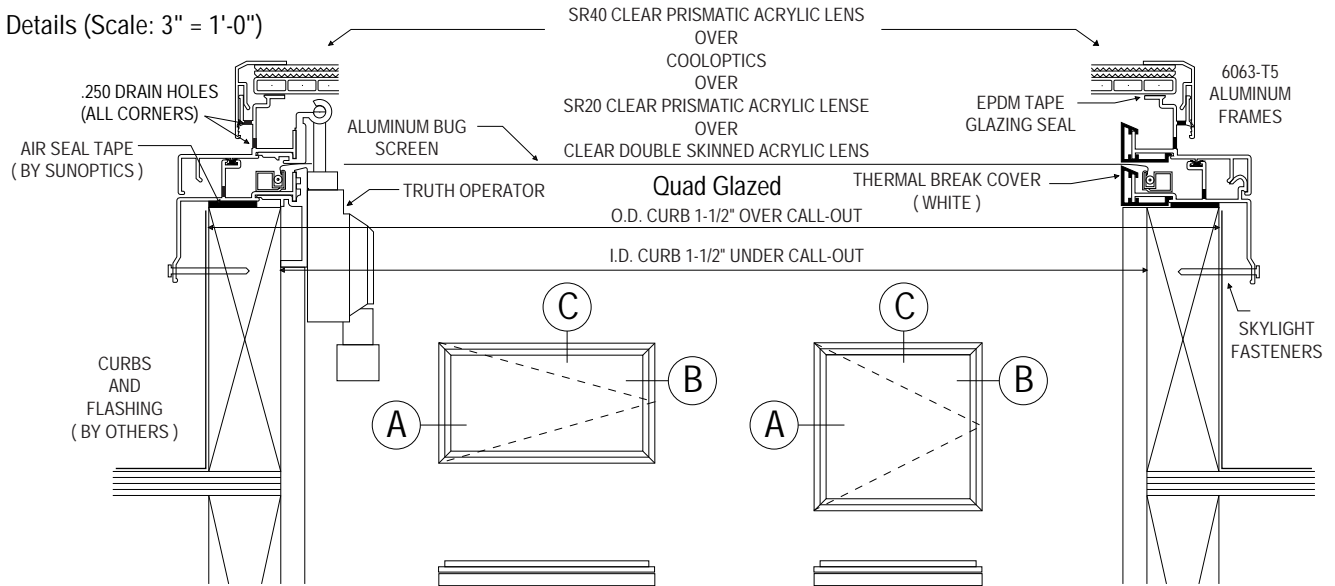


Frame Model 840B  
Section 07810

Standard Frame Finish  
Bronze, Mill

Special colors available

Details (Scale: 3" = 1'-0")



#### Standard Sizes (Call-Out Dimensions)

Size	Flat	Outside Curb (+ 1 1/2)	Inside Curb (- 1 1/2)
1414	■	17 1/2" x 17 1/2"	14 1/2" x 14 1/2"
1420	■	17 1/2" x 25 1/2"	14 1/2" x 22 1/2"
1430	■	17 1/2" x 37 1/2"	14 1/2" x 34 1/2"
1440	■	17 1/2" x 49 1/2"	14 1/2" x 46 1/2"
2020	■	25 1/2" x 25 1/2"	22 1/2" x 22 1/2"
2030	■	25 1/2" x 37 1/2"	22 1/2" x 34 1/2"
2040	■	25 1/2" x 49 1/2"	22 1/2" x 46 1/2"
2060	■	25 1/2" x 73 1/2"	22 1/2" x 70 1/2"
2080	■	25 1/2" x 97 1/2"	22 1/2" x 94 1/2"
2828	■	33 1/2" x 33 1/2"	30 1/2" x 30 1/2"
2840	■	33 1/2" x 49 1/2"	30 1/2" x 46 1/2"
3030	■	37 1/2" x 37 1/2"	34 1/2" x 34 1/2"
3040	■	37 1/2" x 49 1/2"	34 1/2" x 46 1/2"
3060	■	37 1/2" x 73 1/2"	34 1/2" x 70 1/2"
3080	■	37 1/2" x 97 1/2"	34 1/2" x 94 1/2"
4040	■	49 1/2" x 49 1/2"	46 1/2" x 46 1/2"
4060	■	49 1/2" x 73 1/2"	46 1/2" x 70 1/2"
4080	■	49 1/2" x 97 1/2"	46 1/2" x 94 1/2"

U Value = .35, Shading coefficient = .32, Visible Light Transmission = .67 (Acrylic Glazing Only)

#### Specifications

- Skylights shall be Sunoptics model 840B (curb mounted) as manufactured by Sunoptics Skylights, 6350 27th Street, Sacramento Ca. 95822 916/395-4700
- Skylights shall be glazed ready for installation.
- Skylight frames shall be fabricated from 6063 T5 aluminum, finish as specified. Frames shall have integral condensation and weepage gutters which drain interior moisture to the outside. Corners shall be mitered and welded. Skylight frames shall be thermally broken. The acrylic glazing shall be separated from the skylight frame with an EPDM rubber air seal gasket.
- Skylights shall be operated using Truth Inc. chain drive manual operator and include an aluminum bug screen.
- Skylights shall be Quad glazed using 2-Clear prismatic outer lenses over CoolOptics over clear double skinned acrylic inner lens, CC2 acrylic, glazed in a flat configuration.
- Skylights shall use 1 fastener for each square foot of skylight area.



**SUNOPTICS**  
**PRISMATIC**  
**SKYLIGHTS**

6350 27th Street  
Sacramento, CA  
95822

916/395-4700  
800/289-4700  
FAX/395-9204

www.sunoptics.com



Joseph Lookup  
Senior Thesis 2005  
Wegmans Fairfax

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# Appendix-1.3



LUMINAIRE F1

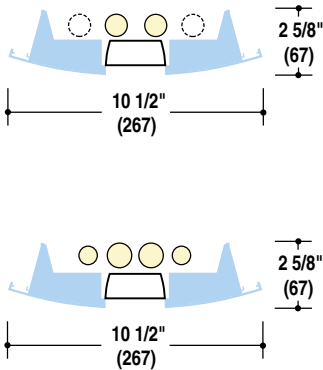


# Ciros™

## P-ID-5200

Pendant-Mounted Indirect/Direct

### Specifications



**HOUSING.** Two-sided housing, 6063 T6 extruded aluminum. For precise row joining, alignment splines slide into slots at end of housing.

**REFLECTORS.** Die-formed high-reflectance aluminum.

**LAMPING.** Available in T8, T5 or T5HO for the outer lamp positions and T8 for the inner (center) lamp position(s), 4' nominal.

**BALLAST.** Low-profile, electronic, high power factor, thermally protected Class P, Sound Rated A, manufactured by a UL Listed manufacturer, as available, determined by Litecontrol. The minimum number of ballasts will be used.

**TANDEM WIRING.** Fixtures wired to switch in-line lamps separately providing two or three (three- and four-lamp cross-section fixtures only) levels of light.

**PRE-WIRING.** Fixtures are supplied with #12 AWG type THHN wire for branch circuits. One end will have factory-installed push-in quick-connects. The other end will be stripped back 1/2" for quick connection in field. For fixtures to accommodate special circuits such as night light and emergency, etc., in-field wiring will be required. See Pre-Wiring Information for details.

**SYSTEM CONNECTORS.** Components to provide system connections between 2 (corner), 3 (tee), or 4 (cross) fixtures are available. Contact factory for details of connectors and suspension hardware required for a specific application.

**END CAPS.** Die-cast sculptured aluminum, 4" long, with no holes or knockouts. Fasteners on each end cap allow close, fast attachment at ends of individual fixtures and ends of rows, finished to match housing.

**SUSPENSION.** Aircraft cable or rigid stem pendants attach to fixture using Litecontrol's easy-hang system, with one attachment plate for use at any support point. **FAI/ACC** field adjustable 51" is standard. See Aircraft Cables and Stems for details.

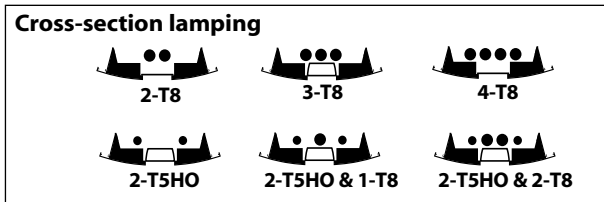
**CERTIFICATION.** Fixture and electrical components shall be UL and/or CUL Listed and shall bear the I.B.E.W., A.F. of L. label.

U.S. Patent No. D431,086

Note: Litecontrol reserves the right to change specifications without notice for product development and improvement.

### Ordering guide

Product, Lamping, & Length									Options							
P	ID	52	2	4	T5HO	2	4	T8	PBSS	CWM	TW	LP/ELB	2CWQ	F	120	
Mounting	Distribution	Series	Lamp Count	Nominal Length (ft)	Lamp Type	Lamp Count*	Nominal Length* (ft)	Lamp Type *	Diffuser	Color	Tandem-Wiring	Ballast	Pre-Wiring	Option	Volts	
P= Pendant-Mounted	ID= Indirect/ Direct		2, 3, 4	4	T8				PBSS	CWM (Matte White) is standard	TW →	LP/ELB LPD/ELB LP/EF	1CWQ	F DSR see Options	120 277	
			4, 6, 8	8									2CWQ			
Mounting Options - add to end of order number	Aircraft Cables		6, 9, 12	12	T5HO T5				FP	see page 9 for other colors		see Ballast options				
			2	4												
FAI/ACC (field adjustable) standard ACC (fixed)	Stems		4	8	T5HO T5				PAT.12(XA)							
			6	12												
P6S (stem) SC/P6 (sloped ceiling) EQ/P6 (earthquake)			2	4	T5HO T5				PRF/O/CWM							
			4	8												
see notes			6	12	T5HO T5				PRF/O/CSL							
			2	4												
see notes			4	8	T5HO T5				WSS/O/CWM							
			6	12												
see notes			1, 2	4	T8				PRF/O/CBC							
			2, 4	8												
see notes			3, 6	12	T8				WSS/O/CSL							
			4	8												
see notes			12	12	T8				WSS/O/CBC							
			2	4												



**P-ID-5224T5HO/24T8-PBSS/O-CWM-TW-LP/ELB-2CWQ-F-120-FAI/ACC** is a typical catalog number for a two-lamp T5HO/two-lamp T8 (4 lamps in cross-section), 4-foot long T5HO/T8 fixture, with parabolic baffles, painted Matte White, tandem wired, low-profile electronic ballast, pre-wired with two-circuit branch wiring and quick-connects, with optional fuse, 120 volts, mounted with field adjustable aircraft cables.

### Questions to Ask

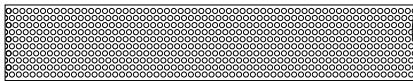
1. 120 or 277 volt?
2. Row information? Desired fixture length?
3. Diffuser type?
4. White, LiteColor, or special color?
5. Tandem wiring?
6. Cables or stems, what length?
7. Other options?



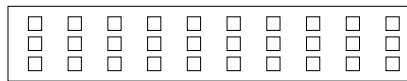
## Photometric data

## Diffusers

- PBSS** Parabolic Baffles. Semi-specular, low iridescence anodized aluminum. Cross-blades are .75" high x 1.34" OC. Lengthwise shielding is 32°. Recommended for use with T8 lamping.
- PBCWM** Parabolic Baffles finished Matte White. Cross-blades are .75" high x 1.34" OC. Lengthwise shielding is 32°. Recommended for use with T8 lamping.
- PBBA** Parabolic Baffles finished Aluminum Gray. Cross-blades are .75" high x 1.34" OC. Lengthwise shielding is 32°. Recommended for use with T8 lamping.
- PBSS/O** Parabolic Baffles. Semi-specular, low iridescence anodized aluminum. Cross-blades are .75" high x 1.34" OC. Lengthwise shielding is 32°. Matte White acrylic overlay. Recommended for use with T5HO lamping.
- PBCWM/O** Parabolic Baffles finished Matte White. Cross-blades are .75" high x 1.34" OC. Lengthwise shielding is 32°. Matte White acrylic overlay. Recommended for use with T5HO lamping.
- PBBA/O** Parabolic Baffles finished Aluminum Gray. Cross-blades are .75" high x 1.34" OC. Lengthwise shielding is 32°. Matte White acrylic overlay. Recommended for use with T5HO lamping.
- FP** White acrylic diffuser, .100" thick.
- PAT.12(XA)** Lens. Diagonal 3/16" conical prisms, .100" thick extruded acrylic.
- PRF/O/CWM, PRF/O/CSL, PRF/O/CBC** Die-formed, 20-gauge steel perforated panels. Pattern has .187" staggered holes .250" OC, 51% open. Available in CWM (Matte White), CSL (Light Silver) or CBC (Camera Black) with white acrylic overlay.
- WSS/O/CWM, WSS/O/CSL, WSS/O/CBC** Die-formed, 20-gauge steel patterned panels. Three 1/2" squares, .718" OC, spaced 1.5" OC. Available in CWM (Matte White), CSL (Light Silver) or CBC (Camera Black) with white acrylic overlay.



PRF Diffuser



WSS Diffuser

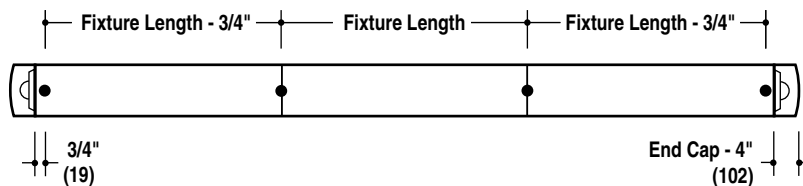
## Ballast options

- LPD/ELB** Low-profile dimming ballast. Manufactured by a UL Listed manufacturer, contact factory for availability.
- LP/EF** Low-profile emergency fluorescent ballast. Battery-powered ballast from a UL Listed manufacturer will operate one T8, T5, or T5HO lamp for 1 1/2 hours. Contact factory for availability.

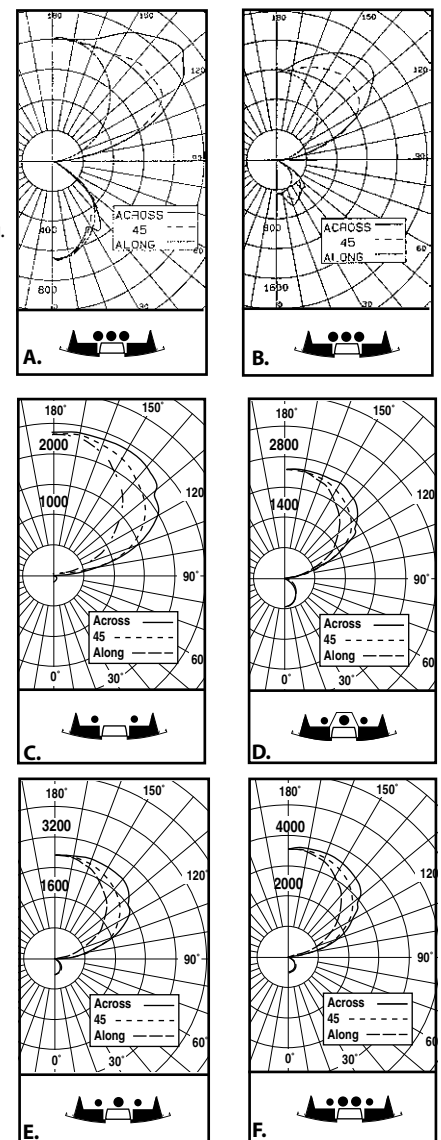
## Options

- F** Fuse. Slow or fast blow, determined by Litecontrol.
- DSR** Distribution Separator Reflector. Allows fixtures to deliver separate Uplight and downlight illumination. Downlight lamps are 1- or 2-T8, tandem wired (specify **TW**). No tools required for installation. Finish is Matte White.

## Row diagram



Fixture Lengths: 4'-3", 8'-6", 12'-9"  
● Indicates pendant locations



**A.** P-ID-5224T8-PBSS-LP/ELB  
86.5% Efficiency Indirect/Direct % = 74/26  
Litecontrol Certified Test Report #27221340

**B.** P-ID-5234T8-PBSS-LP/ELB  
81.1% Efficiency Indirect/Direct % = 80/20  
Litecontrol Certified Test Report #27231340

**C.** P-ID-5224T5HO-PBSS/O-LP/ELB  
92.9% Efficiency Indirect/Direct % = 97/3  
Litecontrol Certified Test Report #27226580

**D.** P-ID-5224T5HO/1T8-PBSS/O-DSR-LP/ELB  
79.1% Efficiency Indirect/Direct % = 87/13  
Litecontrol Certified Test Report #27339580

**E.** P-ID-5224T5HO/1T8-PBSS/O-LP/ELB  
86.5% Efficiency Indirect/Direct % = 92/8  
Litecontrol Certified Test Report #27239580

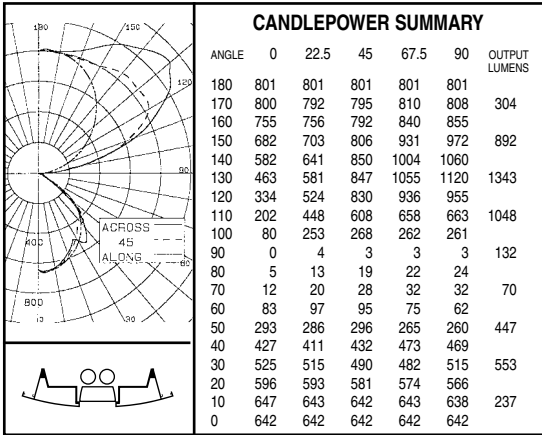
**F.** P-ID-5224T5HO/2T8-PBSS/O-LP/ELB  
85.1% Efficiency Indirect/Direct % = 91/9  
Litecontrol Certified Test Report #27249580

For photometric information on other combinations, see website.

online Quick Find 52  
Click on



**PHOTOMETRIC DATA: 2T8 Lamps**



**P-ID-5224T8-PBSS-LP/ELB 86.5% Efficiency**  
Litecontrol Certified Test Report #27221340

RCC	80				70				50				30				10				0
	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	50	30	10	0
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	50	30	10	0
RCR	0	.88	.88	.88	.88	.78	.78	.78	.78	.61	.61	.61	.44	.44	.44	.30	.30	.30	.23	.23	.23
1	.81	.77	.74	.72	.72	.69	.67	.64	.54	.52	.51	.40	.39	.38	.27	.27	.26	.20	.20	.20	.20
2	.74	.68	.63	.59	.66	.61	.57	.54	.48	.45	.43	.36	.34	.33	.25	.24	.23	.18	.18	.18	.18
3	.68	.60	.55	.50	.61	.54	.50	.46	.43	.40	.37	.32	.30	.29	.23	.21	.20	.16	.16	.16	.16
4	.62	.54	.48	.43	.56	.49	.43	.39	.38	.35	.32	.29	.27	.25	.20	.19	.18	.14	.14	.14	.14
5	.57	.47	.42	.37	.51	.43	.38	.34	.34	.31	.28	.26	.24	.22	.19	.17	.16	.13	.13	.13	.13
6	.53	.43	.37	.32	.47	.39	.33	.29	.31	.27	.24	.24	.21	.19	.17	.15	.14	.11	.11	.11	.11
7	.48	.39	.32	.28	.43	.35	.29	.25	.28	.24	.21	.21	.19	.17	.15	.14	.12	.10	.10	.10	.10
8	.45	.35	.28	.24	.40	.31	.26	.22	.25	.21	.18	.19	.17	.15	.14	.12	.11	.09	.09	.09	.09
9	.41	.31	.25	.21	.37	.28	.23	.19	.23	.19	.16	.17	.15	.13	.13	.11	.10	.08	.08	.08	.08
10	.38	.28	.23	.19	.34	.26	.21	.17	.21	.17	.14	.16	.13	.11	.11	.10	.08	.07	.07	.07	.07

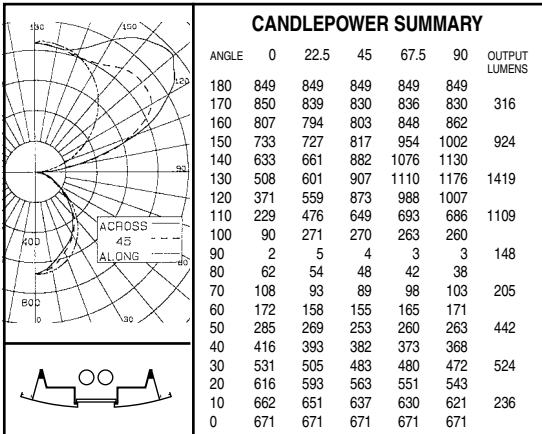
Floor Cavity Reflectance .20

**ZONAL LUMEN SUMMARY**

ZONE	LUMENS	% LAMP	% LUMINAIRE
180-90°	3702	63.84	73.81
90-0°	1314	22.66	26.19
180-0°	5017	86.50	100.00

**LUMINANCE SUMMARY (fL)**

ANGLE	0°	45°	90°
45°	1993	2181	2039
55°	1383	1247	903
65°	219	411	366
75°	104	357	433
85°	88	576	532



**P-ID-5224T8-XA-LP/ELB 91.6% Efficiency**  
Litecontrol Certified Test Report #27221010

RCC	80				70				50				30				10				0
	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	50	30	10	0
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	50	30	10	0
RCR	0	.93	.93	.93	.83	.83	.83	.83	.65	.65	.65	.48	.48	.48	.32	.32	.32	.25	.25	.25	.25
1	.85	.82	.78	.75	.76	.73	.70	.67	.57	.55	.54	.42	.41	.40	.29	.28	.28	.21	.21	.21	.21
2	.78	.71	.66	.62	.69	.64	.60	.56	.50	.47	.45	.38	.36	.34	.26	.25	.24	.19	.19	.19	.19
3	.71	.63	.57	.52	.64	.57	.52	.47	.45	.41	.38	.34	.31	.29	.23	.22	.21	.16	.16	.16	.16
4	.65	.56	.49	.44	.58	.50	.45	.40	.40	.36	.33	.30	.27	.25	.21	.19	.18	.14	.14	.14	.14
5	.60	.49	.43	.38	.53	.45	.39	.34	.36	.31	.28	.27	.24	.22	.19	.17	.16	.12	.12	.12	.12
6	.55	.45	.38	.33	.49	.40	.34	.30	.32	.28	.24	.24	.21	.19	.17	.15	.14	.11	.11	.11	.11
7	.51	.40	.33	.28	.45	.36	.30	.26	.29	.24	.21	.22	.19	.17	.16	.14	.12	.10	.10	.10	.10
8	.47	.36	.29	.25	.42	.32	.27	.23	.26	.22	.19	.20	.17	.15	.14	.12	.11	.08	.08	.08	.08
9	.43	.33	.26	.22	.39	.29	.24	.20	.23	.19	.16	.18	.15	.13	.13	.11	.09	.07	.07	.07	.07
10	.40	.30	.23	.19	.36	.27	.21	.17	.21	.17	.14	.16	.13	.11	.12	.10	.08	.07	.07	.07	.07

Floor Cavity Reflectance .20

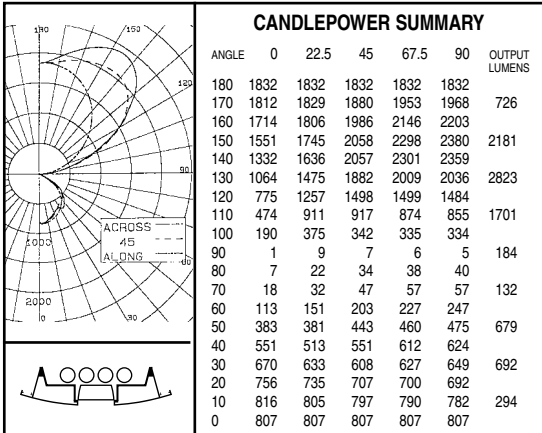
**ZONAL LUMEN SUMMARY**

ZONE	LUMENS	% LAMP	% LUMINAIRE
180-90°	3885	66.99	73.13
90-0°	1427	24.62	26.87
180-0°	5313	91.61	100.00

**LUMINANCE SUMMARY (fL)**

ANGLE	0°	45°	90°
45°	1917	1727	1733
55°	1504	1354	1455
65°	1212	1051	1225
75°	1264	1072	1120
85°	1369	709	710

**PHOTOMETRIC DATA: 4T8 Lamps**



**P-ID-5244T8-PBSS-LP/ELB 81.1% Efficiency**  
Litecontrol Certified Test Report #27241340

RCC	80				70				50				30				10				0
	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	50	30	10	0
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	50	30	10	0
RCR	0	.81	.81	.81	.71	.71	.71	.71	.54	.54	.54	.38	.38	.38	.23	.23	.23	.16	.16	.16	.16
1	.74	.71	.68	.65	.65	.63	.60	.58	.47	.46	.45	.33	.33	.32	.20	.20	.20	.14	.14	.14	.14
2	.68	.62	.58	.54	.60	.55	.51	.48	.42	.39	.37	.30	.28	.27	.18	.18	.17	.12	.12	.12	.12
3	.62	.55	.50	.45	.55	.49	.44	.41	.37	.34	.32	.27	.25	.23	.17	.16	.15	.11	.11	.11	.11
4	.57	.49	.43	.38	.50	.43	.38	.35	.33	.30	.27	.24	.22	.20	.15	.14	.13	.10	.10	.10	.10
5	.52	.43	.37	.33	.46	.39	.33	.30	.30	.26	.23	.21	.19	.17	.14	.12	.11	.08	.08	.08	.08
6	.48	.39	.33	.28	.42	.34	.29	.25	.27	.23	.20	.19	.17	.15	.12	.11	.10	.07	.07	.07	.07
7	.44	.35	.29	.24	.39	.31	.26	.22	.24	.20	.18	.17	.15	.13	.11	.10	.09	.06	.06	.06	.06
8	.40	.31	.25	.21	.36	.28	.23	.19	.21	.18	.15	.16	.13	.11	.10	.09	.08	.05	.05	.05	.05
9	.37	.28	.22	.18	.33	.25	.20	.17	.19	.16	.13	.14	.12	.10	.09	.08	.07	.05	.05	.05	.05
10	.35	.25	.20	.16	.31	.23	.18	.15	.18	.14	.12	.13	.10	.09	.08	.07	.06	.04	.04	.04	.04

Floor Cavity Reflectance .20

**ZONAL LUMEN SUMMARY**

ZONE	LUMENS	% LAMP	% LUMINAIRE
180-90°	7591	65.44	80.73
90-0°	1812	15.62	19.27
180-0°	9403	81.06	100.00

**LUMINANCE SUMMARY (fL)**

ANGLE	0°	45°	90°
45°	2586	2864	3044
55°	1819	2311	2662
65°	310	768	750
75°	164	596	732
85°	177	930	976



# Lighting Specification Bulletin

<b>CovRguard™ Shatter Protected</b>	
<b>Product Code:</b> 10023	
<b>Description:</b> F32T8XLSP30WMCVG	

<b>Specification:</b>
<b>Firm Name :</b>
<b>Job Name :</b>

<b>General</b>	
Product Code	10023 ⚡
Description	F32T8XLSP30WMCVG
Subcategory	CovRguard™ Shatter Protected
<b>Physical</b>	
Bulb Type	T8
Base Type	Medium BiPin (G13)
Nominal Length (In.)	48.00
Nominal Length (mm)	1220
Max Overall Length (In.)	47.78
Bulb Nominal Diameter in inches	1
<b>Photometric</b>	
Lumens (Initial)	2740
Lumens (Mean)	2570
Color Temperature (K)	3000
<b>Electrical</b>	
Average Rated Life	24000
Watts	32
Nominal Lamp Volts	137
Minimum Starting Temp (deg F)	50
<b>Miscellaneous</b>	
Footnotes	Lumen rating based on approximate 3% reduction in light output with CovRguard™

sleeving. Blocks 100% of UV-B and UV-C. Blocks from 75 to 99% of UV-A, depending on lamp type. Watt-Miser™, Watt-Miser™ Plus, F28T8/UMX and Energy Efficient (E) lamps are intended for use where ambient temperatures are 60 F (16 C) or higher and where the lamp surface is protected from strong air drafts. Failure to protect the lamp surface may result in reduced life, poor starting or erratic operation, such as flickering or spiraling. All T12 Watt-Miser™ lamps are intended for use on two-lamp, indoor, lead, high power factor ballasts and are not recommended for use with dimming or reduced current systems. The use of T12 Watt-Miser™ lamps on single lamp ballasts may shorten lamp life. T12 Rapid Start Watt-Miser™ lamps are intended for use only with Rapid Start Ballasts. F40 Rapid Start Watt-Miser™ lamps on high frequency electronic systems may display erratic starting before end of life. T8 Watt-Miser™ lamps are intended for use only with instant start ballasts. F28T8/UMX lamps are designed for use on UltraMax ballasts.

All values are design values or typical values when measured under laboratory conditions. Information provided is subject to change without notice. Where applicable, values are based on guidelines published in ANSI. For more information see Terms and Conditions in the li

#### ➤ Reduced Wattage



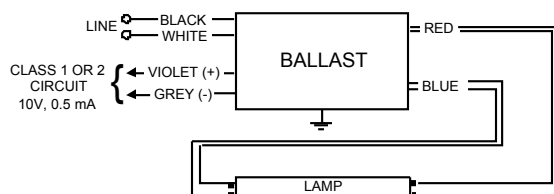
## IZT-132-SC@277

Brand Name	MARK VII 0-10V
Ballast Type	Electronic Dimming
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 (Watts) (min/max)	Ballast Factor (min/max)	MAX THD %	Power Factor	Lamp Current Crest Factor	B.E.F.
F17T8	1	17	50/10	0.07	06/19	0.05/0.94	10	0.99	1.6	4.95
F25T8	1	25	50/10	0.10	07/27	0.05/0.98	10	0.99	1.6	3.63
<b>* F32T8</b>	<b>1</b>	<b>32</b>	<b>50/10</b>	<b>0.13</b>	<b>08/35</b>	<b>0.05/1.00</b>	<b>10</b>	<b>0.99</b>	<b>1.6</b>	<b>2.86</b>

### Wiring Diagram



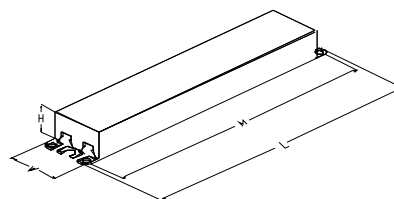
Diag. 55A

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

### Standard Lead Length (inches)

	in.	cm.		in.	cm.
Black	22	55.9	Yellow/Blue		0
White	22	55.9	Blue/White		0
Blue	46	116.8	Brown		0
Red	26	66	Orange		0
Yellow		0	Orange/Black		0
Gray	36	91.4	Black/White		0
Violet	36	91.4	Red/White		0

### Enclosure



### Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
9.50 "	1.7 "	1.18 "	8.90 "
9 1/2	1 7/10	1 9/50	8 9/10
24.1 cm	4.3 cm	3 cm	22.6 cm

Revised 06/13/2003



Data is based upon tests performed by Advance Transformer in a controlled environment and 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.

### ADVANCE TRANSFORMER CO.

O'HARE INTERNATIONAL CENTER · 10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018  
 Customer Support/Technical Service: Phone: 800-372-3331 · Fax: 630-307-3071  
 Corporate Offices: Phone: 800-322-2086



<b>IZT-132-SC@277</b>	
Brand Name	MARK VII 0-10V
Ballast Type	Electronic Dimming
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 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 or integral leads color coded per ANSI C82.11.

#### Section II - Performance Requirements

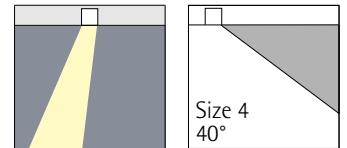
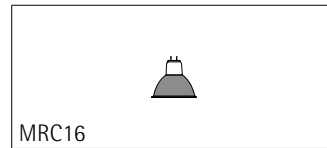
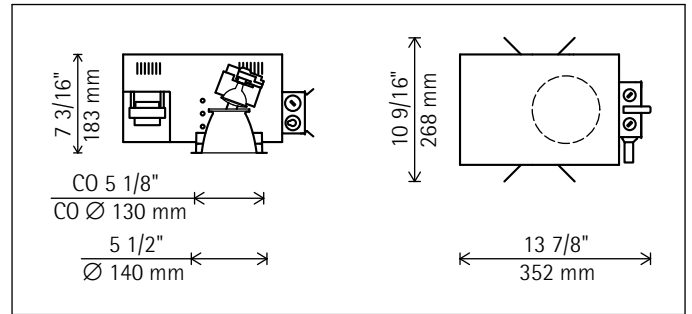
- 2.1 Ballast shall be Programmed Start.
- 2.2 Ballast shall be provided with integral protection circuitry to withstand connection of low voltage control leads to mains power supply. In this event, ballast shall default to maximum light output.
- 2.3 Ballast shall contain auto restart circuitry in order to restart lamps without resetting power.
- 2.4 Ballast shall operate from 50/60 Hz input source of 120V or 277V with sustained variations of +/- 10% (voltage and frequency) with no damage to the ballast. IntelliVolt models 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 ballast.
- 2.5 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.
- 2.6 Ballast shall have a Power Factor greater than 0.98 at full light output and greater than 0.90 throughout the dimming range for primary lamp.
- 2.7 Ballast shall have a maximum ballast factor of 1.00 (1.18 for HL versions) at maximum light output and 0.03 at minimum light output for primary lamp application.
- 2.8 Ballast shall provide for a Lamp Current Crest Factor of 1.7 or less throughout the dimming range in accordance with lamp manufacturer recommendations.
- 2.9 Ballast input current shall have Total Harmonic Distortion (THD) of less than 10% when operated at nominal line voltage with primary lamp.
- 2.10 Ballast shall have a Class A sound rating.
- 2.11 Ballast shall have a minimum starting temperature of 10C (50F) for primary lamp.
- 2.12 Ballast shall provide Lamp EOL Protection Circuit for all T5, T5/HO, CFL lamps, and T8 lamps operating on 4-lamp ballast.
- 2.13 Ballast shall control lamp light output from 100% - 3% relative light output for T8 and CFL lamps and 100% - 1% relative light output for T5/HO lamps.
- 2.14 Ballast shall ignite the lamps at any light output setting without first going to another output setting.
- 2.15 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 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).

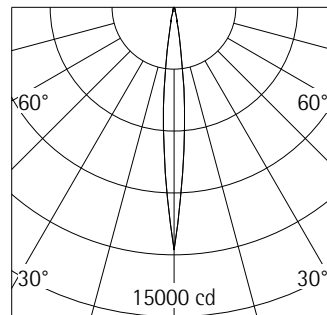
#### Section IV - Other

- 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.



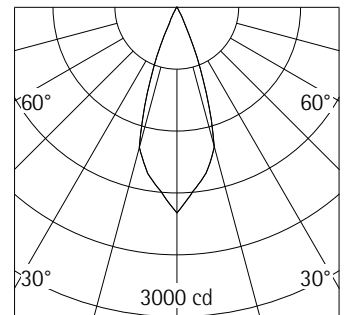
**22427.023**  
Reflector color Silver  
**MRC16 50W 12V GU5.3 10°**  
MRC16 50W 12V GU5.3 36°

**Product description**  
Lampholder carrier: cast aluminum, black powder-coated, designed as heat sink, 0°-20° tilt, 360° rotation.  
Mounting ring: plastic, white (RAL9002), with fixing springs.  
Mounting box for preinstallation with junction box for through-wiring, black powder-coated.  
Magnetic transformer 120/12V, 60Hz inside mounting box. Snap-in plug for connection between transformer and downlight.  
Low brightness reflector: aluminum, specular anodized. Cut-off angle 40° from horizontal. Softec lens.  
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: 9.59 lbs / 4.35 kg



MRC16 50W 12V GU5.3 10°

h(ft)	E(fc)	D(ft)
		10°
3	1313	0'6"
6	328	1'1"
9	146	1'7"
12	82	2'1"
15	53	2'7"



MRC16 50W 12V GU5.3 36°

h(ft)	E(fc)	D(ft)
		36°
3	222	1'11"
6	56	3'11"
9	25	5'10"
12	14	7'10"
15	9	9'9"

**ERCO**

# LC Directional downlight

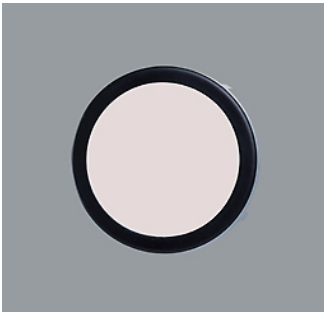
## Accessories



**83980.000**

Cover ring

Metal, white. For covering the gap where ceiling cut-outs are too big. Inner and outer diameter to be specified when placing order.



**83974.000**

Skintone filter

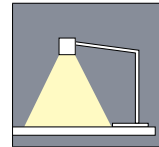
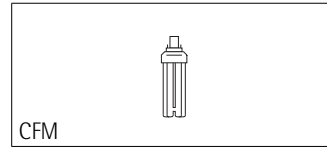
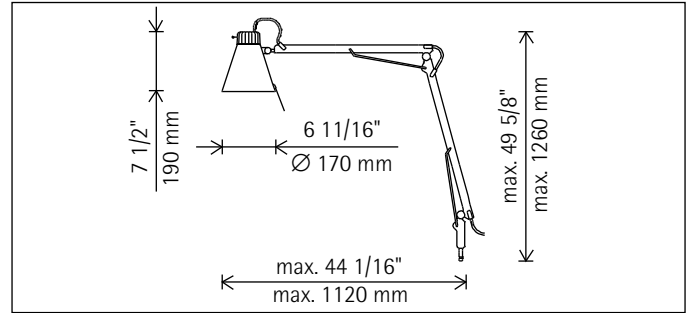
## EXN 50W GU5.3 MR16 36D 1BL



### PRODUCT DATA

<b>Product Number</b>	<b>251744</b>
Full product name	EXN 50W GU5.3 MR16 36D 1BL
Ordering Code	BC50MR16/FL36 EXN 10PK
Pack type	1 Blister
Pieces per pack	1
Packs per case	10
Pack UPC	046677251741
EAN2US	-
Case Bar Code	50046677251746
Successor Product number	-
ANSI Code Halogen	EXN
<b>Wattage[W ]</b>	<b>50W</b>
Base	GU5.3 [GU5.3]
Voltage[V ]	12V
Bulb	MR16 [MR 16inch/50mm]
Beam Angle[D ]	36D
Packing Type	1BL [1 Blister]
Execution	Open
Operating Position	Universal[Universal]
Packing Configuration	10
Rated Avg. Life[hr ]	3000
Dimmable	Yes
Approx. MBCP[cd ]	-
<b>Color Rendering Index[Ra8 ]</b>	<b>100</b>
<b>Color Temperature[K ]</b>	<b>3000</b>
Overall Length C[mm ]	46
Diameter D[mm ]	50

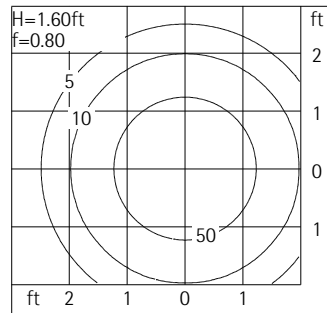




33189.023 Silver  
CFM 26W GX24d-3 1800lm

**Product description**

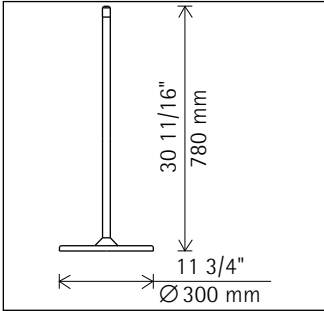
Light head: aluminum, anodized.  
Switch. Cast aluminum lampholder carrier, designed as heat sink.  
Articulated arm: aluminum profile, anodized. Stabilising of forces by means of visible steel connecting struts with internal springs.  
Hinges: cast aluminum. Plastics elements for optimum conduct- or routing visible within range of joints, however otherwise concealed.  
Mounting pegs with mounting and retaining washers for mounting to fixing, which is to be ordered separately.  
Cable with 3-pin plug and control gear 120V, 60Hz, L 8,25ft / 2500mm.  
Fresnel lens as safety glass.  
Weigth: 3.97 lbs / 1.80 kg



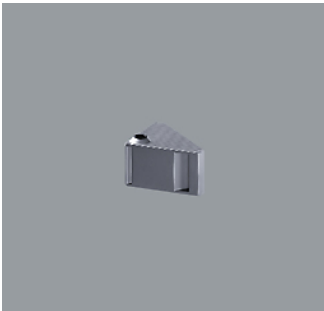
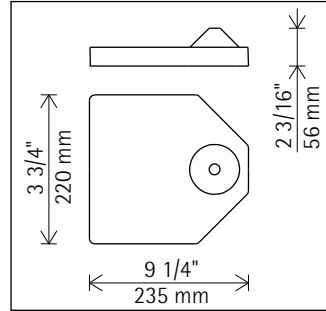
## Accessories



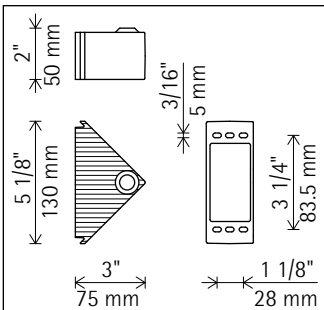
**33190.000**  
 Lucy Floor standing base  
 Plate: steel, silver powder-coated,  $\varnothing$  11 3/4" / 300mm.  
 Tube: steel, silver powder-coated,  $\varnothing$  1" / 25mm, Length 30 11/16" / 780mm.  
 Weight 18.70lbs / 8.50kg.



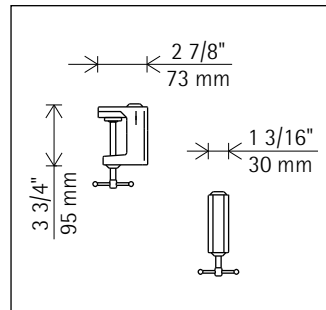
**33193.000**  
 Lucy Desk top base  
 Cast aluminum, silver powder-coated.  
 Length 9 1/4" / 235mm.  
 Width 8 5/8" / 220mm.  
 Height 2 3/16" / 56mm.  
 Weight 14.10lbs / 6.40kg.



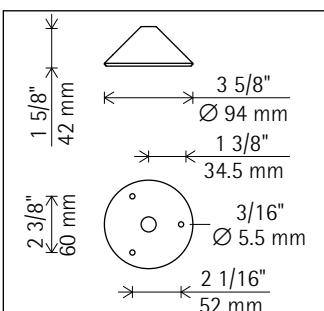
**33191.000**  
 Lucy Wall bracket  
 Cast aluminum, silver powder-coated.  
 Length 5 1/8" / 130mm.  
 Width 3" / 75mm.  
 Height 2" / 50mm.  
 Weight 0.44lbs / 0.20kg.



**33194.000**  
 Lucy Table clamp  
 Cast aluminum, silver powder-coated. Clamp extension up to 2" / 50mm.  
 Length 2 7/8" / 73mm.  
 Width 1 3/16" / 30mm.  
 Height 3 3/4" / 95mm.  
 Weight 0.55lbs / 0.25kg.



**33192.000**  
 Lucy Table base  
 Cast aluminum, silver powder-coated.  
 To be screwed on table-top.  
 Diameter 3 11/16" / 94mm.  
 Height 1 5/8" / 42mm.  
 Weight 0.77lbs / 0.35kg.



**Product Number:** 20680**Order Abbreviation:** CF26DD/835**General Description:** DULUX 26W double compact fluorescent lamp with 2-pin base, 3500K color temperature, 82 CRI, ECOLOGIC**Product Information**

Abbrev. With Packaging Info.	CF26DD835 50/CS 1/SKU
Average Rated Life (hr)	10000
Base	G24D-3
Bulb	T4
Color Rendering Index (CRI)	82
Color Temperature/CCT (K)	3500
Family Brand Name	Dulux® D
Industry Standards	ANSI C78.901 - 2001, IEC 60901- 0526
Initial Lumens at 25C	1710
Mean Lumens at 25C	1548
Maximum Overall Length - MOL (in)	6.8
Maximum Overall Length - MOL (mm)	173
NEMA Generic Designation (current)	CFQ26W/G24D/835
Nominal Wattage (W)	26.00

**Additional Product Information**[Product Documents, Graphs, and Images](#)[Packaging Information](#)**Footnotes**

- Approximate initial lumens after 100 hours operation.
- The life ratings of fluorescent lamps are based on 3 hr. burning cycles under specified conditions and with ballast meeting ANSI specifications. If burning cycle is increased, there will be a corresponding increase in the average hours life.
- Rule of Thumb for Compact Fluorescent Lamps: Divide wattage of incandescent lamp by 4 to determine approximate wattage of compact fluorescent lamp that will provide similar



# CX-100 Passive Infrared Occupancy Sensor

CONTROL - OC-1



*Turns lights on and off based on occupancy*

*User-adjustable time delay and sensitivity*

*ASIC technology reduces components and provides greater reliability*

*Choice of four coverages patterns*

*Built-in light level sensor*

*Isolated relay for use with HVAC or other control systems*

## Product Overview

### Description

The Watt Stopper's CX-100 and CX-105 are passive infrared occupancy sensors that control lighting in a wide variety of applications. These sensors provide superior coverage and performance with great energy savings.

### Operation

The 24 VDC occupancy sensors control lighting systems through Watt Stopper power packs. The units operate by turning lighting on when they detect the difference between infrared energy from a human body in motion and the background space. After the area is vacated and the time delay elapses, lighting automatically turns off.

### Coverage Choices

The CX sensors are available with a choice of coverage patterns. The standard lens offers coverage up to 1000 square feet for typical desktop activity. When using the -1 or -3 lens, motion moving toward sensors will begin to be detected at 55 to 60 feet.

### Applications

The CX sensors are ideal for large areas and can cover up to 2000 square feet of walking motion. By choosing the proper lens pattern for each application, the sensors can reliably cover large offices, computer rooms, classrooms, aisle ways, warehouses, and open offices where coverage cut-off is desired. Corner mounting to a wall or ceiling adds versatility and more control to the coverage.

## Features

- ASIC technology reduces components and enhances reliability
- Pulse Count Processing eliminates false offs without reducing sensitivity
- Detection Signature Analysis eliminates false triggers; provides immunity to RFI and EMI
- Digital time delay adjustable from 15 seconds to 30 minutes
- Adjustable sensitivity enables occupancy detection to match the level of activity for each space
- Integrated light level sensor (CX-100) can create bi-level control for added energy savings
- Multi-level Fresnel lens for superior desktop occupancy detection with four lens patterns
- Isolated relay can interface with HVAC, EMS systems, monitoring systems, or with an additional lighting load
- Dual-element, temperature compensated pyroelectric sensor
- Swivel mounting bracket for convenient corner mounting to wall or ceiling
- LED indicates occupancy detection





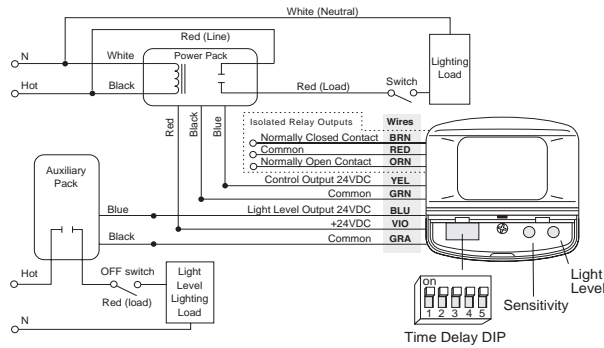
# CX-100 Technical Information

## Specifications

- Dual-element, temperature compensated pyroelectric sensor
- CX-100 contains isolated relay with N/O and N/C outputs; rated for 1 Amp at 24 VDC/VAC
- Time delay adjustment from 15 seconds to 30 minutes
- Integrated light level sensor (CX-100) – works from 3 to 200 footcandles
- Units per power pack: CX-100 up to 6 (B), up to 8 (BZ); CX-105 up to 14 (B), up to 18 (BZ)
- Dimensions: 3.3" x 3.3" x 2.1" (83.8mm x 83.8mm x 53.3mm) (W x L x D)
- UL and CUL listed; five year warranty

## Wiring & Settings

### Wiring Diagram

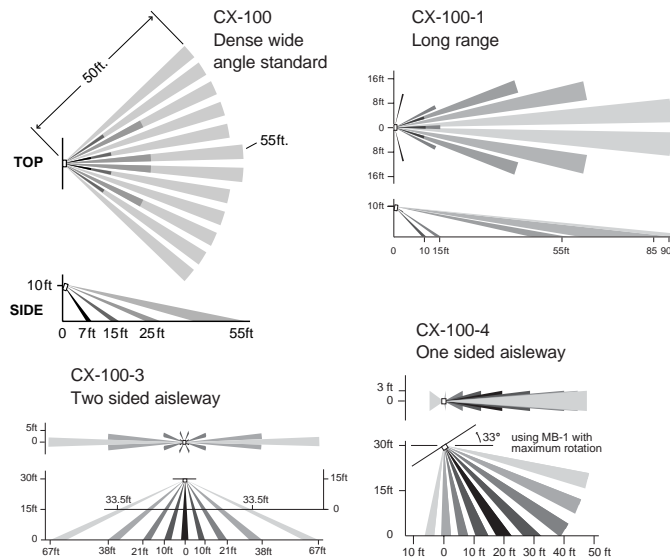


### DIP Switch Settings

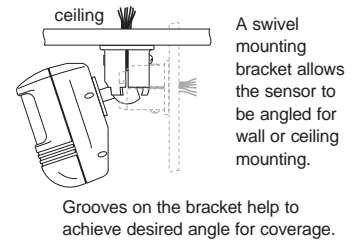
Time Delays	DIP Switch #				
	1	2	3	4	5
15 seconds	●	●	●	●	●
2 minutes	●	●	●	●	●
4 minutes	●	●	●	●	●
6 minutes	●	●	●	●	●
8 minutes	●	●	●	●	●
10 minutes	●	●	●	●	●
12 minutes	●	●	●	●	●
14 minutes	●	●	●	●	●
16 minutes	●	●	●	●	●
18 minutes	●	●	●	●	◆
20 minutes	●	●	●	●	●
22 minutes	●	●	●	●	●
24 minutes	●	●	●	●	●
26 minutes	●	●	●	●	●
28 minutes	●	●	●	●	●
30 minutes	●	●	●	●	●
Override	●	●	●	●	●

●=on    ■=off    ◆=factory preset

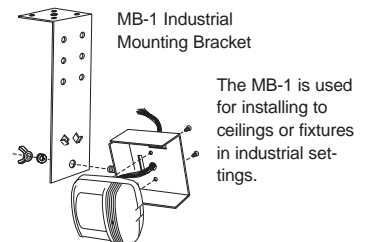
## Coverage & Mounting



### Mounting



### Industrial Mounting



Coverages shown are maximum and represent half-step walking motion. Under ideal conditions, with no barriers or obstacles, coverage for half-step walking motion with the standard lens can reach up to 2000 sq ft while coverage for typical desktop activity can reach up to 1000 sq ft. When using the -1 or -3 lens, motion moving toward sensors will begin to be detected at 55 to 60 feet.

## Ordering Information

Catalog No.	Description	Voltage	Current	Coverage
<b>CX-100</b>	<b>PIR sensor; full-featured; dense wide angle lens</b>	<b>24 VDC</b>	<b>19 mA</b>	<b>up to 2000 sq ft</b>
CX-100-1	PIR sensor; full-featured; long range lens	24 VDC	19 mA	up to 90 linear ft
CX-100-3	PIR sensor; full-featured; two-sided aisleway lens	24 VDC	19 mA	up to 120 linear ft
CX-100-4	PIR sensor; full featured; one-sided aisleway lens	24 VDC	19 mA	up to 50 linear ft
CX-105	PIR sensor; dense wide angle lens	24 VDC	8 mA	up to 2000 sq ft
CX-105-1	PIR sensor; long range lens	24 VDC	8 mA	up to 90 linear ft
CX-105-3	PIR sensor; two-sided aisleway lens	24 VDC	8 mA	up to 120 linear ft
CX-105-4	PIR sensor; one-sided aisleway lens	24 VDC	8 mA	up to 50 linear ft
MB-1	Industrial Mounting Bracket (recommended for use with -3 and -4 lenses)			
MB-2	Industrial Mounting Bracket for HID fixtures			



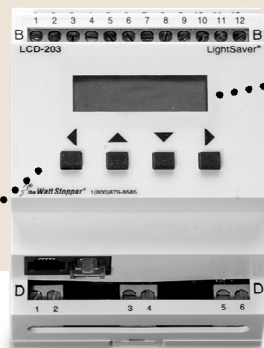
# LightSaver® LCD-203 Dimming Controller

CONTROL - DC-1

Low voltage automatic dimming control module

Three control channels with individually programmable settings

Pushbutton programming and automated setup



LCD display of photocell readings

Optional wall switch override for manual control

Open loop control

PROJECT

LOCATION/TYPE

## Product Overview

### Description

The Watt Stopper LightSaver LCD-203 daylighting controller provides automatic dimming control for fluorescent and HID fixtures. It is an open loop controller providing up to three zones of control from a single photocell. It also integrates with occupancy sensors and accommodates individual occupant overrides via an optional wall switch.

### Operation

The LCD controller is part of a system that includes the LS-290C photocell and the BT-203 Power Pack. Each of the LCD controller's three channels has a 0-10 VDC output and connects to its own dedicated relay in the power pack. The photocell measures daylight and transmits the data to the controller. Each channel in the controller raises or lowers light levels, while the respective relays in the power pack switch lighting on or off. When daylight is adequate for a channel to fully dim, lights switch off after an adjustable time delay. This capability can be disabled for zones where lighting should remain on.

### Multiple Channel Control

To achieve balanced dimming control, users group fixtures receiving comparable daylight levels into up to three control groups or zones. Zones closest to the daylight source are dimmed the most, while zones further away from the daylight source dim less. Unused channels may be disabled.

### Applications

The LCD controller is suitable for a wide range of applications, such as open office areas, classrooms, retail stores, and any application with skylights. It is particularly suitable for applications that require independently dimming fixtures in adjoining zones. The load shedding capability can further reduce light levels during critical periods or during periods of reduced occupancy. If an occupancy sensor is used, its non-occupancy signal initiates dimming by the LCD controller prior to turning lighting off.

## Features

- Simplified setup and calibration
- Optional dimming wall switch (LS-4C) provides manual dimming and ON/OFF control so users can adjust lighting as desired
- Seven individually adjustable parameters for each channel: setpoint, minimum output, maximum output, ramp rate, fade rate, cutoff time delay, load shed limit
- Menu-driven, pushbutton programming without special tools
- Automatic internal calculation for dimming requirements of individual channels for simplified setup
- DIN rail mounting
- California Title 24-2005 compliant



www.wattstopper.com  
800.879.8585



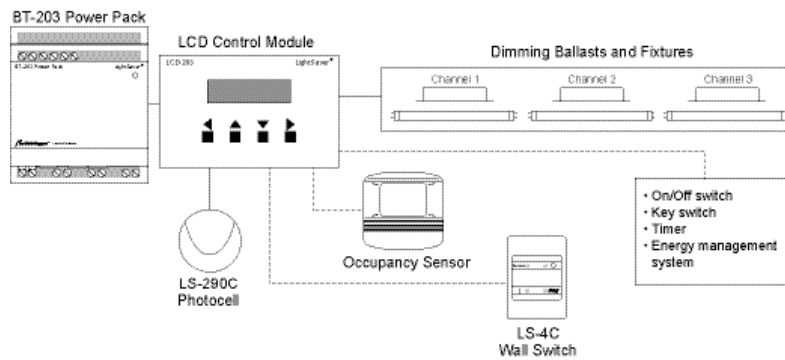
# LCD Technical Information

## Specifications

- Class 2 low voltage device
- Compatible with standard 0-10 volt dimming ballasts
- Supports up to 50 ballasts per dimming channel
- Photocell range from 3 - 6,000 footcandles (30 - 64,000 lux)
- Programmable dimming and fade rates from 5-60 seconds
- Selectable cut off delay from 0-20 minutes or can be disabled
- Programmable minimum output from 0-4VDC
- Programmable maximum output from 6-10VDC
- Load shed output from 0-10 VDC
- Setpoint range from 5-60 fc
- 24VDC supply voltage provided by BT-203
- Control output voltage to ballasts 0-10VDC
- Dimensions: 3.5" x 2.81" x 2.5" (89mm x 71mm x 64mm) LxWxD
- UL and CUL listed; five year warranty

## System Layout & Wiring

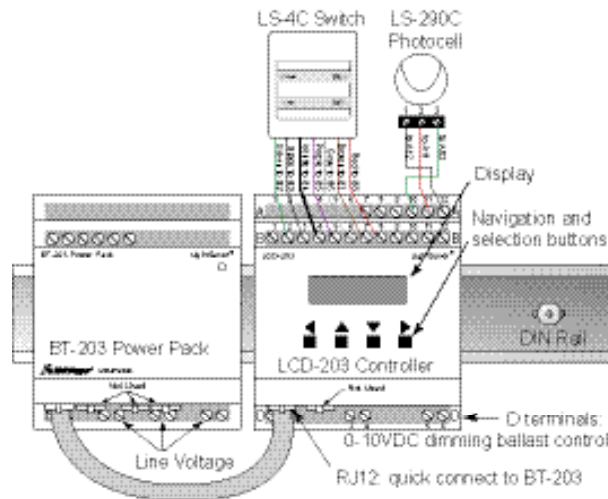
### LCD System Layout



The LCD Dimming Control System consists of an LCD control module, an LS-290C photocell, and a BT-203 power pack.

Users may add options to the system to increase functionality, such as the LS-4C wall switch and occupancy sensors.

### LCD-203 Wiring and Settings



## Ordering Information

Catalog No.	Description	Voltage	Control Channels
<b>LCD-203</b>	Dimming control module	<b>24 VDC</b>	<b>three</b>
LS-290C	Photocell 3 - 6000 footcandle range		
BT-203	Power Pack		
<b>Dimming control system options:</b>			
Product group	Catalog No.	Description	
Switch	LS-4C	Wall Switch	
Enclosure	LS-E8	Screw-cover enclosure 8" x 8" x 4" (203.2mm x 203.2mm x 101.6mm)	
	LS-E12	Screw-cover enclosure 12" x 12" x 4" (304.8mm x 308.8mm x 101.6mm)	





# InteliSwitch<sup>®</sup> Digital Time Switch

- ◆ Automatically turns lights off after a preset time
- ◆ Digital operation – no twist timer
- ◆ Bright electroluminescent LCD shows timer's countdown
- ◆ Dual 120/277 VAC operation
- ◆ No minimum load requirement
- ◆ Compatible with electronic ballasts and motor loads
- ◆ Three year warranty; UL and CUL listed



## System Information

The InteliSwitch is a digital time switch which automatically turns lights off after a preset time. It is a great lighting control choice for areas that are inappropriate for occupancy sensor use and is far more functional and convenient than twist-timer switches. It features a low-profile enclosure, dual 120/277 VAC operation, an electroluminescent back-lit LCD to show the amount of time remaining before lights turn off, and convenient push button operation. It is compatible with all electronic ballasts and motor loads.

## Operation Time-out Setting

The InteliSwitch replaces existing wall switches and fits behind a standard decorator style wall plate. It has user-adjustable DIP switch settings for: time-out period, time scroll, 1-minute flash warning, and beep warning. The time-out period is the amount of time that the lights remain on once the ON/OFF switch is turned on. It is adjusted by a DIP switch to hold lights on for a time ranging from 5 minutes to 12 hours for the TS-200 and 10 minutes to 2 hours for the TS-300 (see charts on back for time-out settings). The lights can be turned off anytime before the time-out expires by pressing the ON/OFF switch. Also, the unit can be reset at any time by holding down the ON/OFF switch for two seconds. This will bring the timer back to its original time-out setting and restart the countdown.

## Time Scroll Setting

The time scroll option is selected with the DIP switch and is used in situations when lights need to be held on for a different amount than the preset time-out period. It allows users to temporarily override the time-out period without adjusting the DIP switch.

**Time Scroll On** With the time scroll option set to on, lights can be held on longer than the time-out period. Pressing the ON/OFF switch for more than 4 seconds will cause the timer to scroll up throughout the possible time-out periods up to the maximum 12 hours. At any time during scrolling when the switch is released, the timer will begin its countdown from that point. The next time the unit is turned on, the timer will go to its original time-out period.

**Time Scroll Off** With the time scroll option set to off, lights can be turned off sooner than the time out period. Here, pressing the ON/OFF switch for more than 4 seconds will cause the timer to scroll down throughout the time-out options until the minimum is reached.

## Warning Indicators

The 1-minute flash warning and beep warning allows time to reset the switch if someone is present. Setting the 1-minute flash warning to on will cause the lights to flash for 1 second, 1 minute before the time-out period expires. Setting the beep warning to on will cause the time switch to beep every 5 seconds during the timer's last minute.

The InteliSwitch can be used to save energy and money in many applications including equipment rooms, storage areas, closets and other building areas as an alternative to occupancy sensors. It can also be used as an HVAC override or to control heat lamps in hotel guest rooms. The InteliSwitch's low cost and easy installation result in fast paybacks.

### The Watt Stopper<sup>®</sup>, Inc.

2800 De La Cruz Blvd.  
Santa Clara, CA 95050

Tel: (408) 988-5331  
Fax: (408) 988-5373

National Technical Support  
Plano, Texas: (800) 879-8585



# InteliSwitch Technical Information

## Specifications

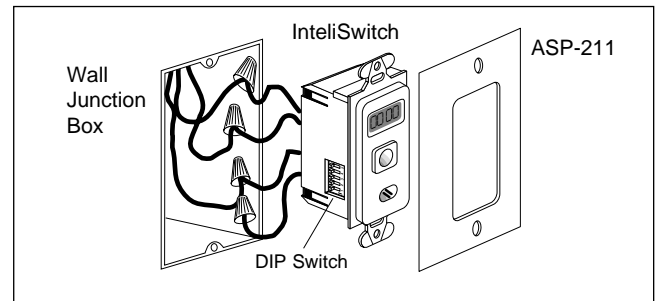
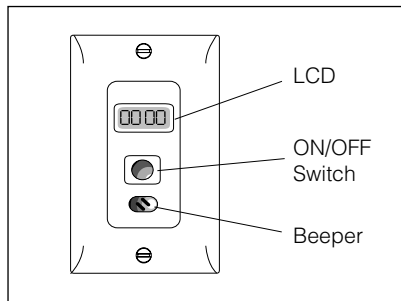
- ◆ Operates at 120 or 277 VAC; No minimum load requirement
- ◆ TS-200, TS-250, TS-260: time-out adjustments range from 5 minutes to 12 hours
- ◆ TS-300, TS-350, TS-360: time-out adjustments range from 10 minutes to 2 hours
- ◆ Compatible with all electronic ballasts and motor loads
- ◆ Optional beep warning every five seconds during last minute of countdown
- ◆ Optional one second light flash warning at one minute before timer runs out
- ◆ **Time scrolling options for overriding the preset time**
- ◆ Simple reset feature for returning the switch to its original preset amount
- ◆ Electroluminescent back-lit Liquid Crystal Display shows timer countdown
- ◆ The Watt Stopper's exclusive Zero Crossing Circuitry, Patented
- ◆ Custom microcontroller enhances reliability
- ◆ Size: 2.68" x 1.69" x 1.50" (68.0mm x 43.0mm x 38.0mm)

## Ordering Information

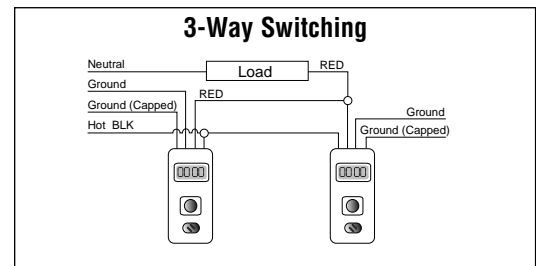
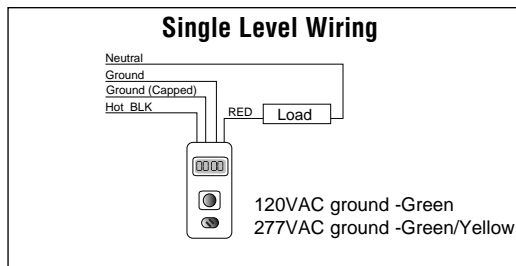
Catalog No.	Voltage	Load Requirements
<b>TS-200</b>	<b>120 VAC, 60 Hz</b> or 277 VAC, 60 Hz	<b>0-800W Ballast for 120 VAC</b> or 0-1200W Ballast for 277 VAC
TS-250	230 VAC, 50 Hz	0-1200W Ballast
TS-260	347 VAC, 60 Hz	0-1500W Ballast
TS-300	120 VAC, 60 Hz or 277 VAC, 60 Hz	0-800W Ballast for 120 VAC or 0-1200W Ballast for 277 VAC
ASP-211	Cover plate for single gang box (one included with each switch)	
ASP-422	Blank cover plate for 2-gang box	
ASP-432	Cover plate for 2-gang box with switch option	

Add to the end of the catalog no.: -W for white, -I for ivory, -A for light almond

## Product Controls & Installation



## Wiring Diagrams



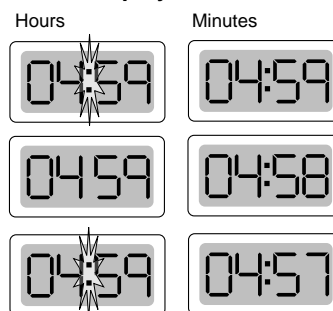
## Time-Out Settings

DIP Switch Time-out Settings	
DIP Switch #	O=Off X=On
<b>Time-Out Period</b>	
5 minutes	O O O O
15 minutes	O O X
30 minutes	O X X
1 hour	X X X
3 hours	X X X
6 hours	X X X
9 hours	X X X
12 hours	X X X
<b>Time Scrolling</b>	
Time Scrolls Down	O
Time Scrolls Up	X
<b>Flash Option</b>	
Flash OFF	O
Flash ON	X
<b>Beeper Option</b>	
Beeper OFF	O
Beeper ON	X

DIP Switch Time-out Settings	
DIP Switch #	1 2 3 4 5 6
<b>Time-Out Period</b>	
10 minutes	O O O
20 minutes	O O X
40 minutes	O X X
60 minutes	X X X
1 hour 15 minutes	X X X
1 hour 30 minutes	X X X
1 hour 45 minutes	X X X
2 hours	X X X
<b>Time Scrolling</b>	
Time Scrolls Down	O
Time Scrolls Up	X
<b>Flash Option</b>	
Flash OFF	O
Flash ON	X
<b>Beeper Option</b>	
Beeper OFF	O
Beeper ON	X

## Timer Displays



The LCD shows the amount of time remaining before lights turn off. When the amount of time remaining is 1 hour or more, the colon flashes. When there are only minutes left in the time-out period, the indicator does not flash, but you see the seconds counting down.



Joseph Lookup  
Senior Thesis 2005  
Wegmans Fairfax

---

# Appendix-1.4

## Wall up/downlight luminaires

High output wall mounted luminaires with fully shielded light source for dual up and down lighting effects for indoor or outdoor applications.

**Housing:** One piece die cast aluminum supplied with universal mounting bracket for direct attachment to 3½" or 4" octagonal wiring box (6610/615) use 538 small opening wiringbox). A round "rotation" plate allows the housing to be precisely leveled (or rotated) after installation.

**Enclosure:** Tempered clear glass, 3/16" thick, retained by one piece die cast aluminum step baffle frame on bottom, flush on top, secured by stainless steel screws threaded into stainless steel inserts. Internal full, dual semi-specular optical system. Fully gasketed for weather tight operation using molded silicone rubber "U-channel".

**Electrical:** Lampholders: Incandescent are double contact bayonet, (6610) stainless steel with porcelain insulator disk with 250°C high temperature leads, rated 600V, or medium base porcelain (6615) with nickel plated copper screw shell supplied with 200°C high temperature leads. H.I.D. are G12, bi-pin, pulse rated 4KV.

Ballasts: are magnetic, HPF, available in 120V or 277V - specify.

**Finish:** Standard finish is an eight step process consisting of two coats of black or white high solids, UV stabilized polyurethane, one with light texture over a phosphate base.

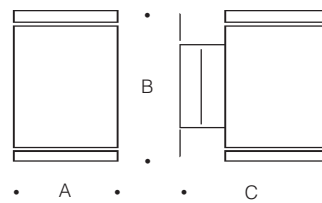
Custom colors supplied on special order.

U.L. listed, suitable for wet locations.

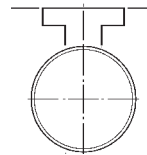
Type:  
 BEGA Product #:  
 Project:  
 Voltage:  
 Color:  
 Options:  
 Modified:

A-1 & A-2 Luminaires

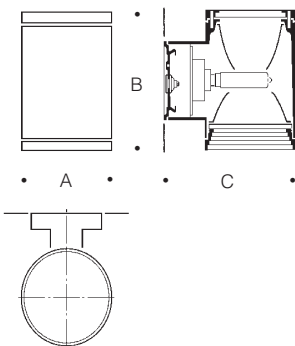
Photometry



Wall mounted luminaires with fully shielded single, horizontal light source for up/down lighting. Die cast aluminum housing, arm, canopy and step baffle. Full anodized aluminum double reflector with clear tempered glass. Color: Black or white.



			Lamp		Lumen	A	B	C
<b>6616MH</b>	Wall	1	39W G12T6 MH		3300	7½	10 <sup>7</sup> / <sub>16</sub>	12
<b>6620MH</b>	Wall	1	70W G12T6 MH		6600	8 <sup>5</sup> / <sub>8</sub>	12 <sup>9</sup> / <sub>16</sub>	13 <sup>9</sup> / <sub>16</sub>



Wall mounted luminaires with fully shielded single horizontal light source for up/down lighting. Die cast aluminum housing, arm, canopy and step baffle. Full anodized aluminum double reflector with clear tempered glass. Color: Black or white.

			Lamp		Lumen	A	B	C
<b>6610/538</b>	Wall	1	Q100W T4 DCB		1800	4 <sup>3</sup> / <sub>8</sub>	6¼	6¼
<b>6615/538</b>	Wall	1	Q150W MED T10		2500	6	8 <sup>5</sup> / <sub>8</sub>	8½
<b>538</b>	Small opening wiring box included							





GE Consumer & Industrial  
Lighting

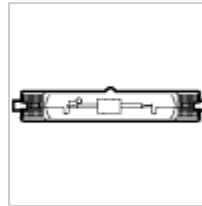
LAMP USED FOR A-1

# Lighting Specification Bulletin

## CMH Double-Ended TD

Product Code: 92587

Description: CMH70/TD/830RX7S



### Specification:

Firm Name :

Job Name :

### General

Product Code	92587
Description	CMH70/TD/830RX7S
Subcategory	CMH Double-Ended TD

### Physical

Bulb Type	T6
Base Type	Rx7s
Bulb Material	UV Block Quartz
Max Overall Length (In.)	4.5
Max Overall Length (mm)	115
Nominal Length (In.)	4.50
Bulb Nominal Diameter (In.)	.75

### Photometric

Average Life in Hours	15000
Lumens (Initial)	7000
Lumens (Mean)	5600
Color Temperature (K)	3000
Warm Up Time (min.) to 90%	2
Effective Arc Length in inches	.2992
Lighted Center Length (In.)	2.25

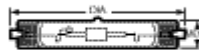
### Electrical

Watts	70
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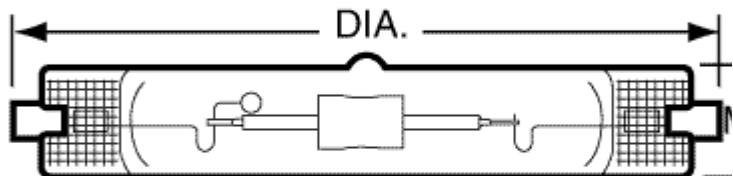
### Luminaire

Operating Position Code	H45
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### Dimensionalized Line Art - Small



### Dimensionalized Line Art - Large



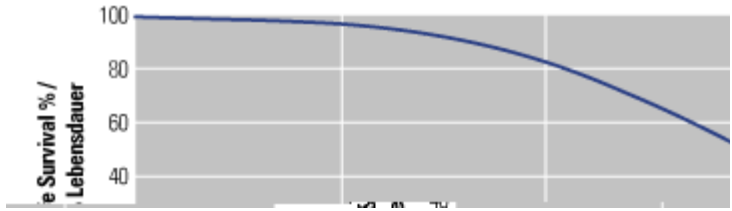
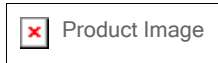
Lamp Mortality

**Ballast-related information**


Minimum Ballast Open Circuit Voltage - RMS - Lag Ballast (Ballast A/B/C)	198/198/198
Minimum Ballast Open Circuit Voltage - Peak Lag Ballast (Ballast A/B/C)	280/280/280

**Miscellaneous**

ANSI Ballast Type	M85, M98, or M139
Footnotes	UV Control is a quartz material that effectively cuts UVB and UVC radiation. Rated life based on 7 hours per start.

**Spectral Power Distribution Graphs**

All values are design values or typical values when measured under laboratory conditions. Information provided is subject to change without notice. Where applicable, values are based on guidelines published in ANSI. For more information see Terms and Conditions in the li

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[CMH Single Ended G12](#)

[CMH Double-Ended TD](#)

[CMH Mini's](#)

[High-Watt CMH SPXX](#)

[CMH Chromafit](#)

[Pulsearc Multi-Vapor Metal Halide Lamps](#)

[Multi-Vapor Metal Halide Lamps](#)

[High Output And Xho Multi-Vapor Metal Halide Lamps](#)

[Sports Lighting](#)

[Protected Multi-Vapor Metal Halide Lamps](#)

[Chromafit Multi-Vapor Metal Halide Lamps \(Hps Retrofit Lamps\)](#)

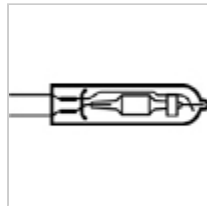
[I-Line Multi-Vapor Metal Halide Lamps \(Mercury Retrofit Lamps\)](#)

[Saf-T-Gard Self-Extinguishing Multi-Vapor Lamps](#)

[Arcstream Metal Halide Lamps](#)

[Lucalox High Pressure Sodium Lamps](#)

[Standby Longlife Lucalox Lamps](#)



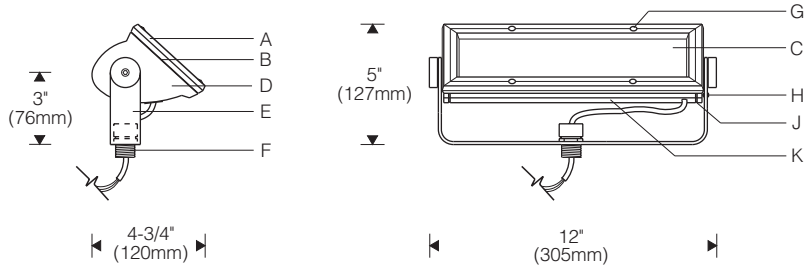
Subcategory	CMH Mini's
<a href="#">Product Code</a>	90352
<a href="#">Description</a>	CMH39TCUVVCU830G8
<a href="#">Watts</a>	39
<a href="#">Lumens (Initial)</a>	3400
<a href="#">Lumens (Mean)</a>	2600
<a href="#">Average Life in Hours</a>	10000
<a href="#">Color Temperature (K)</a>	3000
<a href="#">Color Rendering Index (Ra) CRI (&gt; or =)</a>	82
<a href="#">Operating Position Code</a>	U
<a href="#">Fixture Type - Open/Enclosed</a>	E
<a href="#">Bulb Type</a>	T4.5
<a href="#">Base Type</a>	BiPin G8.5
<a href="#">Max Overall Length (In.)</a>	3.37
<a href="#">Max Overall Length (mm)</a>	86
<a href="#">LCL (In.)</a>	2
<a href="#">ANSI Ballast Type</a>	M130
<a href="#">Sales Unit UPC</a>	043168903523
<a href="#">Case UPC</a>	043168903523
<a href="#">Case Quantity</a>	12
<a href="#">Footnotes</a>	UV Control is a quartz material that effectively cuts UVB and UVC radiation. Rated life based on 7 hours per start. Use electronic ballast, peak lead time system which can shut itself off if ballast overheating occurs.

[Set the current view to the default view](#)

[Return to product list](#)

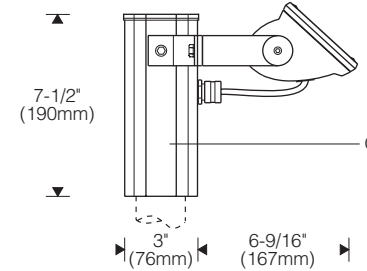
**A-3 & A-4**

**V Mount** 1:8 Scale

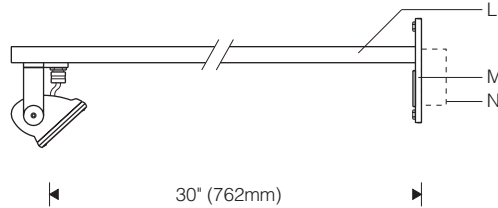


**Side-Mount Slipfitter**

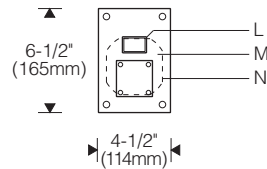
(For use with X Mount)



**Cantilever: Lighting Downward** 1:12 Scale  
(For use with X Mount)

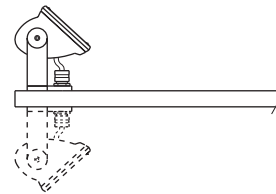


**Mounting Plate**



**Lighting Upward**

(Upward/downward optional)



**Specifications**

- |  |   |   |   |
|--|---|---|---|
| <b>A</b> Mitred extruded aluminum door frame                               | <b>D</b> Die-cast aluminum end plates         | <b>H</b> Locking set screw                    | <b>M</b> Welded aluminum mounting plate with splice access cover              |
| <b>B</b> Precured silicone door and lens gasket                            | <b>E</b> Aluminum yoke                        | <b>J</b> Aluminum reveal plates (black)       | <b>N</b> Outlet box (by others)   |
| <b>C</b> Micro-prismatic, thermal and impact resistant tempered glass lens | <b>F</b> 1/2" NPT nipple                      | <b>K</b> Specular extruded aluminum reflector | <b>O</b> Accessory extruded aluminum slipfitter for 2-3/8" O.D. pole or tenon |
|  | <b>G</b> Tamper-resistant captive door screws | <b>L</b> 1" x 1-1/2" aluminum arm             |   |

**Finish:**

Exterior surfaces - 6 stage pretreatment and electrostatically applied thermoset polyester powder coating for a durable abrasion, fade and corrosion resistant finish. Choice of semi-gloss colors (see ordering information).

Reflector - extruded high purity aluminum with clear anodized specular finish. All hardware and components - non corrosive stainless steel or aluminum. Door secured with captive tamper-resistant (#10 Torx) screws in stainless steel threaded reflector inserts to prevent seizing. Yoke attaches with recessed hex socket screws.

**Mounting:**

1/2" NPT nipple (wet location outlet box or fitting by others).

Aluminum cantilever mounting assembly ordered separately; specify X mount. Suitable backing structure required.

Accessory slipfitter ordered separately. Top or side mount for single unit; specify X mount. Fits 2-3/8" O.D. stanchion, pole, or tenon (by others).

**Electrical:**

Use 90°C wire for supply connections. Leads exit reflector through watertight flush cord entry and silicone coated fiberglass sleeving with 8" (.2m) exposed beyond nipple. 60" (1.5m) leads for X mount.

Tungsten halogen - recessed single contact (RSC) or DC bayonet lampholders retained with patented clamping supports for maximum heat dissipation.

Metal halide - G12 lampholder for use with single ended lamp. Remote HPF high reactance autotransformer (HX-HPF) ballast rated for -20°F/-29°C starting. Die-cast aluminum weatherproof ballast enclosure includes four 1/2" NPT threaded entries. Optional electronic ballast with automatic shut-off to eliminate end-of-life cycling. Optional remote ballast for dry indoor location.

For complete ballast specifications, see Accessories Section.

**Standard:**

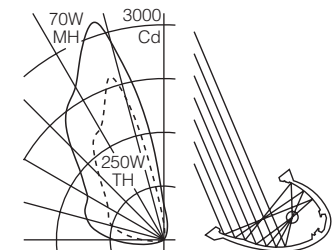
UL listed or CSA certified for wet locations.

**Features**

- Compact size, minimal setbacks and wide spacings - ideal for unobtrusively highlighting walls, facades, signs
- Durable and secure - thermal and impact resistant lens, tamper-resistant fasteners, set screw in yoke locks aiming
- Precured silicone gaskets, unique flush cord entry - seal out dirt and moisture, maintain performance

**Performance**

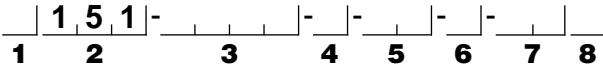
Two parabolic reflector sections drive light up (or down) the vertical plane from one edge. An elliptical section redirects its light to a parabola and shields the lamp. Asymmetry is maximized resulting in high beam efficiency and superior surface uniformity. The fast "runback" minimizes glare and spill light. Wide lateral distribution permits greater spacings.



For complete photometrics, visit [www.elliptipar.com](http://www.elliptipar.com).



To form a Catalog Number



1 Source

M = Metal halide  
T = Tungsten halogen

2 Style

151 = Small outdoor, remote ballast

3 Lamp

Lamp Code	Watt-age	Lamp Number	Volt-age(s)	Ballast	Dis-tance
Ceramic Metal Halide*					
035G	35	CMH35/T6/G12	A, B 1, 2	HX-HPF Electr.	15'(4.5m) 15'(4.5m)
070G	70	CMH70/T6/G12	A, B, H 1, 2	HX-HPF Electr.	10'(3m) 15'(4.5m)
150G	150	CMH150/T6/G12	A, B, H 1, 2	HX-HPF Electr.	10'(3m) 15'(4.5m)

Tungsten Halogen

0100	100	Q100DC	A	
0150	150	Q150DC	A	
0200	200	Q200T3	A	
0250	250	Q250DC	A	

For complete lamp and ballast information, see Accessories Section.  
\* Metal halide lamps using ceramic arc tubes yield higher light output than lamps with quartz arc tubes. They offer improved lamp-to-lamp color consistency and a more stable color temperature over their life (±200K). Standard lamp color is 3000K / 80+ CRI.

4 Mounting

V = External yoke with 1/2" NPT nipple (wet location outlet box or fitting by others)  
X = External yoke for use with accessory cantilever or slipfitter (order separately)

5 Finish

02 = Semi-gloss white  
06 = Dark bronze  
07 = Silver  
08 = Semi-gloss black  
12 = Green  
99 = Custom RAL or computer matched color to be specified, consult sales representative.

Project: \_\_\_\_\_

6 Voltage/Ballast

Magnetic  
A = 120V  
B = 277V  
H = 347V (Canada)\*  
Electronic  
1 = 120V  
2 = 277V

\* Not available for 35W metal halide

7 Option (See Accessories Section for specifications)

00 = No options  
0D = Remote ballast for dry indoor location  
0H = Long distance remote metal halide ballast, 35W: 15' min. up to 50' max. (4.5m - 15m), 70W: up to 50' max. (15m), 150W: up to 50' max. (15m)  
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

M151 - 150G - V - 07 - B - 0H0

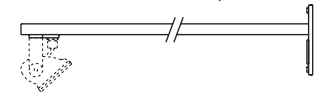
Small outdoor model for use with 150 watt metal halide lamp. External yoke with 1/2" NPT nipple. Silver powder coat finish. Remote 277V magnetic ballast in weatherproof enclosure. Long distance remote ballast (up to 50' for 150W). UL.

Type: \_\_\_\_\_

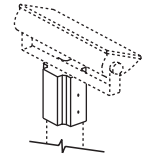
Accessories

Order separately. See Accessories Section for specifications.

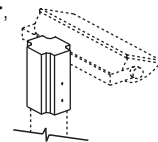
AC | | 30 | = Cantilever, 30" (760mm) setback (for use with X mount unit)  
0 = UL  
J = CSA  
5 Finish  
S = single unit (down or upward facing only)  
V = double unit (down and upward facing)



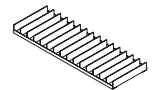
ASF | | T10 = Top-mount slipfitter, for 2-3/8" O.D. pole, stanchion or tenon (for use with single X mount unit)  
5 Finish



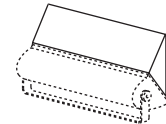
ASF | | S10 = Side-mount slipfitter, for 2-3/8" O.D. pole, stanchion or tenon (for use with single X mount unit)  
5 Finish



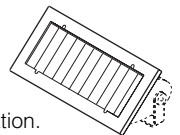
AEBV | | 0D0 = External vertical blade baffle, black for lengthwise shielding  
2 = 25° shielding  
4 = 45°



AVB | | 0D0 = Cutoff visor  
5 Finish



AXF = Wet location color filter assembly, interchangeable frame with stripped color glass. Maximum 200W TH, 70W CMH.  
Note: Consult factory for complete specifications and ordering information.



AFK000X | | = Ballast fuse kit  
0 = UL  
J = CSA





## CMH Double-Ended TD Item Detail

Basic

LSB

### Products

#### High Intensity Discharge

CMH PAR

CMH Elliptical

CMH Single Ended G12

CMH Double-Ended TD

CMH Mini's

High-Watt CMH SPXX

CMH Chromafit

Pulsearc Multi-Vapor  
Metal Halide Lamps

Multi-Vapor Metal Halide  
Lamps

High Output And Xho  
Multi-Vapor Metal Halide  
Lamps

Sports Lighting

Protected Multi-Vapor  
Metal Halide Lamps

Chromafit Multi-Vapor  
Metal Halide Lamps (Hps  
Retrofit Lamps)

I-Line Multi-Vapor Metal  
Halide Lamps (Mercury  
Retrofit Lamps)

Saf-T-Gard Self-  
Extinguishing Multi-  
Vapor Lamps

Arcstream Metal Halide  
Lamps

Lucalox High Pressure  
Sodium Lamps

Standby Longlife Lucalox  
Lamps

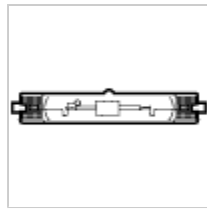
Ecolux Nc Non-Cycling  
High Pressure Sodium  
Lamps (Tclp Compliant)

Ecolux High Pressure  
Sodium Lamps (Tclp  
Compliant)

Deluxe Lucalox High  
Pressure Sodium Lamps

E-Z Lux High Pressure

Lamp for A-3 & A-4



### General

Product Code	92588
Description	CMH70/TD/942RX7S
Subcategory	CMH Double-Ended TD

### Physical

Bulb Type	T6
Base Type	Rx7s
Bulb Material	UV Block Quartz
Max Overall Length (In.)	4.5
Max Overall Length (mm)	115
Nominal Length (In.)	4.50
Bulb Nominal Diameter (In.)	.75

### Photometric

Average Life in Hours	15000
Lumens (Initial)	7000
Lumens (Mean)	5600
Color Temperature (K)	4200
Warm Up Time (min.) to 90%	2
Effective Arc Length in inches	.2992
Lighted Center Length (In.)	2.25

### Electrical

Watts	70
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### Luminaire

Operating Position Code	H45
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### Ballast-related information

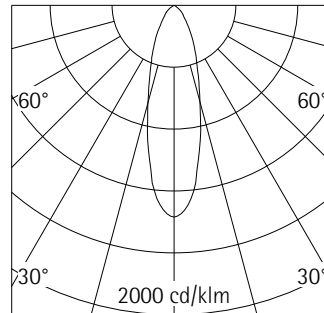
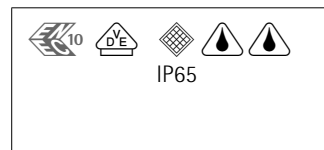
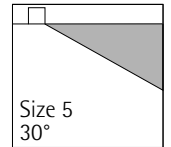
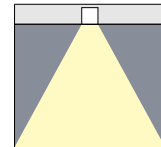
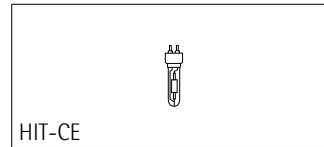
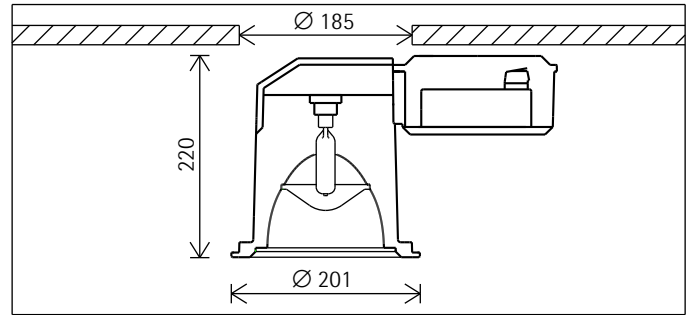
Minimum Ballast Open Circuit Voltage - RMS - Lag Ballast (Ballast A/B/C)	198/198/198
Minimum Ballast Open Circuit Voltage - Peak Lag Ballast (Ballast A/B/C)	280/280/280

### Miscellaneous

ANSI Ballast Type	M85, M98, or M139
Footnotes	UV Control is a quartz material that effectively cuts UVC radiation. Rated life based on 7 hours per start.

LSB Data Available

Set the current view to the default view



HIT-CE 35W G12 3300lm

h(m)	E(lx/klm)	D(m)
		29°
1	1370	0.52
2	343	1.03
3	152	1.55
4	86	2.07
5	55	2.59

**81042.000**

Reflector colour Silver  
 HIT-CE 35W G12 3300lm  
 ECG

**Product description**

Housing: cast aluminium, silver powder-coated. Mounting with 3-point support and screw-tightening. Side-mounted control gear: cast aluminium, black powder-coated.

2 cable entries. Through-wiring possible. 5-pole terminal block. Electronic control gear.

Darklight reflector: aluminium, bright anodised. Cut-off angle 30°. Diffuser as lamp cover: glass, frosted.

Screw mounted cover frame with safety glass: corrosion-resistant, cast aluminium, No-rinse surface treatment. Silver double powder-coated. To be removed together with Darklight reflector for lamp replacement.

Protection mode IP65: dust-proof and water-jet proof.

Weight: 2.70 kg

# MasterColor CDM-T 35W/830 G12 T6 1CT



**General**  [+ Images](#) [+ Texts](#)

## PRODUCT DATA

Product Number	223289
Full product name	MasterColor CDM-T 35W/830 G12 T6 1CT
Ordering Code	CDM35/T6/830
Pack type	1 Lamp in a Folding Carton
Pieces per pack	1
Packs per case	12
Pack UPC	046677223281
EAN2US	-
Case Bar Code	50046677223286
Successor Product number	-
Wattage[W ]	35W
Color Code	830 [CCT of 3000K]
Base	G12
Bulb	T6 [Diameter: .75 inch]
Packing Type	1CT [1 Lamp in a Folding Carton]
Packing Configuration	12
Bulb Finish	Clear
Operating Position	Universal[Universal]
Rated Avg. Life[hr ]	12000
System Power EL[W ]	44
Lamp Voltage[V ]	88
Dimmable	No
Color Rendering Index[Ra8 ]	81
Color Designation	Warm White
Color Description	830 Warm White
Color Temperature[K ]	3000
Initial Lumens[Lm ]	3300
Overall Length C[mm ]	103
Diameter D[mm ]	20

**DESCRIPTION**

EPIC Collection delivers custom luminaire flexibility with the quality and availability expectations of standard specification grade product. Offered in two (2) housing sizes, and hundreds of unique combinations, EPIC Collection can be dressed to suit any application. Recognizing evolving environmental and legislative trends, EPIC Collection delivers world class optical solutions to the decorative luminaire marketplace. EPIC Collection offers targeted solutions for full cutoff compliance, spill light control, and path of egress illumination while integrating the latest lamp technologies into visually comfortable lighting solutions.

**SPECIFICATION FEATURES****A...Top**

Cast aluminum modern or classical top housing maintains a minimum 1/8" nominal sidewall thickness. Top attaches to cast aluminum mounting arm hub with four (4) stainless steel fasteners. One (1) piece silicone gasket between mounting hub and top casting seals out moisture and contaminants.

**SPECIFICATION FEATURES****B...Midsection**

Milky white acrylic lens utilizes continuous silicone gaskets to seal lens to top casting and shade. The following mid section options feature cast aluminum construction and stainless steel assembly hardware: Solid, Window, Louvered, Slot, Solid Rings. Luminous Rings feature clear acrylic rings suspended by stainless steel spacers and hardware. Optional colored luminous rings utilize a colored gel film attached behind luminous mid lens to project color along edges of rings.

**C...Shades**

Heavy gauge precision spun aluminum shades offer superior surface finish and consistency in form.

**D...Doorframe Assembly**

Used with horizontally lamped segmented optical systems. Heavy wall die-cast aluminum door and doorframe seal to underside of shade with a thick wall continuous silicone gasket. Door hinges opens via release of two (2) stainless steel screws. Impact resistant 1/8" thick tempered flat or sag glass lens (clear or frosted finish) seals to door with a one-piece silicone gasket.

**E...Optical Systems**

Choice of five (5) high efficiency segmented optical systems constructed of premium 95% reflective anodized aluminum sheet. Optical segments are rigidly mounted inside a thick gauge aluminum housing for superior

protection. All segment faces are clean of rivet heads, tabs, or other means of attachment which may cause streaking in the light distribution. All reflector modules feature toolless removal, quick disconnect wiring plugs, and are 360° field rotatable. Optional MA milky white acrylic jar utilizes a vertical lamp orientation. Maximum 100W on HID. 3R and 5R options utilize a prismatic clear tempered glass refractor along with a vertical lamp orientation. Vertically lamped optical systems are secured with a die-cast retainer collar, stainless steel hardware, and a one-piece silicone gasket, and feature standard high reflectance white powder paint finish on underside of shade for optimal fixture efficiency.

**F...Electrical Tray**

Ballast and related electrical componentry are mounted to a reinforced one piece tray with integral handle. Quick disconnect wiring plugs allow easy tray removal during routine maintenance. Plug-in starter standard on HPS luminaires.

**G...Finish**

Housing and arm finished in a 5 stage premium TGIC polyester powder coat paint, 2.5 mil nominal thickness for superior protection against fade and wear. Standard colors include black, bronze, grey, white, dark platinum, graphite metallic, and hartford green. RAL and custom color matches available. Consult your Streetworks Representative for more information.



## MEM MODERN EPIC MEDIUM

4 2 - 1 7 5 W

Metal Halide

High Pressure Sodium

Compact Fluorescent

Electrodeless Fluorescent

DECORATIVE AREA

COLLECTION



**DARK SKY FRIENDLY**

When specified with horizontal lamp and solid mid section.

**EPA**

Effective Projected Area:  
Flat Lens .94  
Sag Lens 1.04

**SHIPPING DATA**

Approximate Net Weight:  
37 lbs. (17 kgs.)

ADW041068



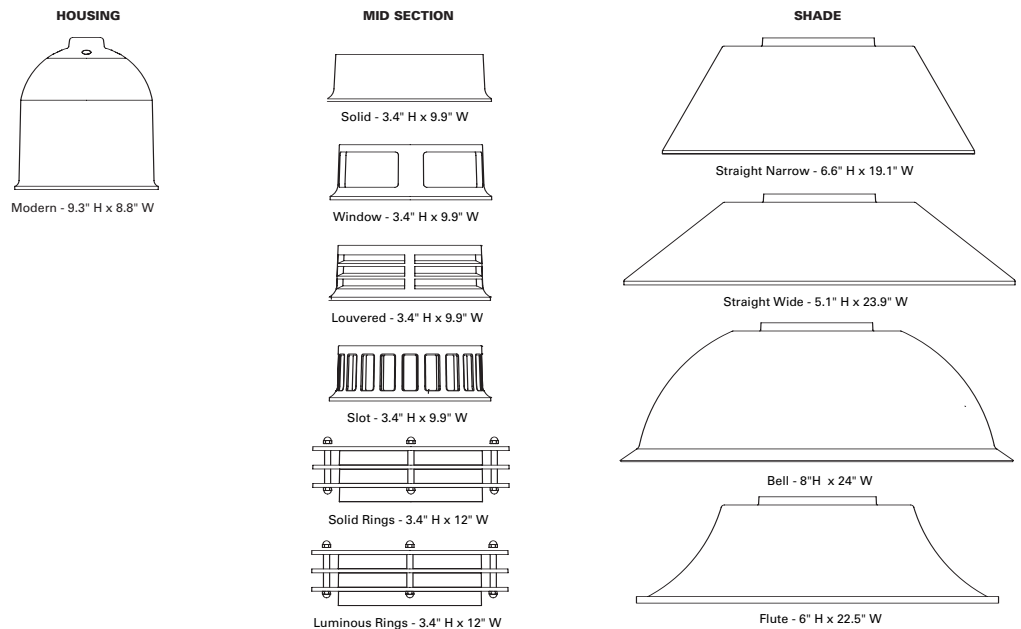
## ORDERING INFORMATION

SAMPLE NUMBER: MEM17MWW2SXSBNBK

<b>MEM</b>										
<b>Product Family</b> MEM=Modern Epic Medium	<b>Lamp Type</b> <sup>6</sup> C=Compact Fluorescent M=MH S=HPS Q=QL Induction	<b>Ballast Type</b> <sup>6</sup> H=Reac./HPF N=NIX/NPF P=HIX/HPF R=Reac./NPF W=CWA F=Fluorescent I=Induction	<b>Voltage</b> <sup>6</sup> 2=120V 0=208V 4=240V 7=277V 8=480V 9=347V K=120/277V wired at 120V L=277/120V wired at 277V N=Multi-Tap wired at 277V W=Multi-Tap wired at 120V	<b>Distribution</b> MA=Milk White Acrylic Jar <sup>7,8</sup> 2S=Type II 3R=Type III Glass <sup>9</sup> 3S=Type III 4S=Type IV SL=Forward Throw Spill Light Eliminator 5R=Type V Glass <sup>9</sup> 5S=Type V SL=Spill Light Eliminator <sup>9</sup>	<b>Mid Section Type</b> X=Solid (Standard) 1=Window 2=Louvered 3=Slot 4=Solid Rings 5=Luminous Rings <b>Optional Mid Section Type</b> 6=Luminous Rings—Red 7=Luminous Rings—Bright Blue 8=Luminous Rings—Deep Green 9=Luminous Rings—Warm Orange	<b>Shade Type</b> SN=Straight Narrow SW=Straight Wide BL=Bell FL=Flute	<b>Color</b> (add as suffix/must specify) <sup>10</sup> AP=Grey BK=Black BZ=Bronze DP=Dark Platinum GM=Graphite Metallic GN=Hartford Green WH=White	<b>Options</b> (add as suffix) 1=Single Fuse <sup>11</sup> 2=Double Fuse <sup>11</sup> C=Emergency Quartz—Separate Circuit <sup>12</sup> E=Emergency Quartz with Time Delay <sup>12</sup> F=Frosted Flat Glass H=House Side Shield <sup>13</sup> L=Lamp Included Q=Quartz Standby <sup>12</sup> R=Frosted Sag Glass V=Vandal Shield (100W Max.) W=Wire Guard S=Sag Glass	<b>Accessories</b> (order separately/replace XX with color suffix) <b>MEM—Modern Epic Medium Arms</b> SA6105-XX=MEM Bishop Single Pole Mount Arm SA6106-XX=MEM Bishop Single Pole Mount Arm with Cross Rod SA6107-XX=MEM Bishop Twin Pole Mount Arm SA6108-XX=MEM Bishop Twin Pole Mount Arm with Cross Rods SA6109-XX=MEM Traditional Single Pole Mount Arm SA6110-XX=MEM Traditional Single Pole Mount Arm with Rounded Upper Bar SA6111-XX=MEM Traditional Single Pole Mount Arm with Rounded Lower Bar SA6112-XX=MEM Traditional Single Pole Mount Arm with 45° Upper Bar SA6113-XX=MEM Traditional Single Pole Mount Arm with 45° Lower Bar SA6114-XX=MEM Traditional Single Pole Mount Arm with 45° Upper Strap SA6116-XX=MEM Traditional Twin Pole Mount Arm SA6117-XX=MEM Traditional Twin Pole Mount Arm with Rounded Upper Bars SA6118-XX=MEM Traditional Twin Pole Mount Arm with Rounded Lower Bars SA6119-XX=MEM Traditional Twin Pole Mount Arm with 45° Upper Bars SA6120-XX=MEM Traditional Twin Pole Mount Arm with 45° Lower Bars SA6121-XX=MEM Traditional Twin Pole Mount Arm with 45° Upper Straps SA6122-XX=MEM Tenon Adapter for 2 3/8" O.D. Horizontal Tenon	<b>Accessory Options</b> (add as suffix to accessory) M=Modern Finial <sup>14</sup> A=Architectural Finial <sup>14</sup> N=Nostalgic Finial <sup>14</sup> 4=NEMA Twistlock Photocontrol Receptacle <sup>15</sup>

**NOTES:** 1 Arms not included. Order Separately. See accessories. 2 All HID lamps are medium-base. 3 Compact Fluorescent lamp only. Available in Type 3S, 4S and 5S and all vertical optical systems. 4 Nominal M.O.L. lamp length of 57W CFL not to exceed 7". 5 Electrodeless Fluorescent QL lamp only. Available in vertically lamped optical systems only. 120V only. 6 Refer to technical section for lamp/ballast/voltage compatibility. 7 Maximum wattage of 100W HID. 8 Vertical Lamp Only. 9 SLE only available with Solid Mid selection. 10 Custom and RAL color matching available upon request. Consult your Cooper Lighting Representative for more information. 11 Compact Fluorescent ballasts contain internal fusing. No supplemental fusing is necessary. CF ballasts are 120 through 277V. 12 Quartz options not available on SL optic, or vertical lamped optical systems. 13 House side shields available on horizontally lamped 2S, 3S, and 4S optical systems only. 14 Traditional Arm Only. 15 Not compatible with finials.

## PRODUCT CONFIGURATOR



NOTE: Specifications and dimensions subject to change without notice.

Basic

LSB

**Products****High Intensity Discharge**

CMH PAR

CMH Elliptical

CMH Single Ended G12

CMH Double-Ended TD

CMH Mini's

High-Watt CMH SPXX

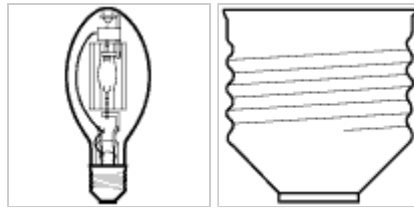
CMH Chromafit

Pulsearc Multi-Vapor  
Metal Halide LampsMulti-Vapor Metal Halide  
LampsHigh Output And Xho  
Multi-Vapor Metal Halide  
Lamps

Sports Lighting

Protected Multi-Vapor  
Metal Halide LampsChromafit Multi-Vapor  
Metal Halide Lamps (Hps  
Retrofit Lamps)I-Line Multi-Vapor Metal  
Halide Lamps (Mercury  
Retrofit Lamps)Saf-T-Gard Self-  
Extinguishing Multi-  
Vapor LampsArcstream Metal Halide  
LampsLucalox High Pressure  
Sodium LampsStandby Longlife Lucalox  
LampsEcolux Nc Non-Cycling  
High Pressure Sodium  
Lamps (Tclp Compliant)Ecolux High Pressure  
Sodium Lamps (Tclp  
Compliant)Deluxe Lucalox High  
Pressure Sodium Lamps

E-Z Lux High Pressure

**General**

<u>Product Code</u>	45688
<u>Description</u>	MXR150/C/U/MED/O
<u>Subcategory</u>	Protected Multi-Vapor Metal Lamps

**Physical**

<u>Bulb Type</u>	ED17
<u>Base Type</u>	Med
<u>Bulb Material</u>	Heat Resistant Glass
<u>Max Overall Length (In.)</u>	5.43
<u>Max Overall Length (mm)</u>	138
<u>Nominal Length (In.)</u>	5.43
<u>Bulb Nominal Diameter (In.)</u>	2.12

**Photometric**

<u>Average Life in Hours</u>	15000
<u>Lumens (Initial)</u>	12000
<u>Lumens (Mean)</u>	8300
<u>Color Temperature (K)</u>	3500
<u>Warm Up Time (min.) to 90%</u>	<2
<u>Lighted Center Length (In.)</u>	3.43

**Electrical**

<u>Watts</u>	150
<u>Nominal Lamp Volts</u>	95

**Luminaire**

<u>Operating Position Code</u>	U
--------------------------------	---

**Ballast-related information**

<u>Minimum Ballast Open Circuit Voltage - RMS - Lag Ballast (Ballast A/B/C)</u>	235
<u>Minimum Ballast Open Circuit Voltage - Peak Lag Ballast (Ballast A/B/C)</u>	332

**Miscellaneous**

<u>ANSI Ballast Type</u>	M102
<u>Additional Information</u>	Coated, protected

# Diesel Generator Set Model DFED 60 Hz

**500 kW, 625 kVA Standby**  
**455 kW, 569 kVA Prime**



## Description

The Cummins Power Generation DF-series commercial generator set is a fully integrated power generation system providing optimum performance, reliability, and versatility for stationary standby or prime power applications.

A primary feature of the DF GenSet is strong motor-starting capability and fast recovery from transient load changes. The torque-matched system includes a heavy-duty Cummins 4-cycle diesel engine, an AC alternator with high motor-starting kVA capacity, and an electronic voltage regulator with three-phase sensing for precise regulation under steady-state or transient loads. The DF GenSet accepts 100% of the nameplate standby rating in one step, in compliance with NFPA 110 requirements.

The standard PowerCommand<sup>®</sup> digital electronic control is an integrated system that combines engine and alternator controls for high reliability and optimum GenSet performance.

Optional weather-protective enclosures and coolant heaters improve starting in extreme operating conditions. A wide range of options, accessories, and services are available, allowing configuration to your specific power generation needs.

Every production unit is factory tested at rated load and power factor. This testing includes demonstration of rated power and single-step rated load pickup. Cummins Power Generation manufacturing facilities are registered to ISO9001 quality standards emphasizing our commitment to high quality in the design, manufacture, and support of our products. The generator set is CSA certified and is available as UL2200 Listed. The PowerCommand control is UL508 Listed.

All Cummins Power Generation systems are backed by a comprehensive warranty program and supported by a worldwide network of 170 distributors and service branches to assist you with warranty, service, parts, and planned maintenance support.

## Features

**UL Listed Generator Set** - The complete generator set assembly is available Listed to UL2200.

**Cummins Heavy-Duty Engine** - Rugged 4-cycle industrial diesel engine delivers reliable power, low emissions, and fast response to load changes.

**Alternator** - Several alternator sizes offer selectable motor-starting capability with low reactance 2/3 pitch windings, low waveform distortion with non-linear loads, fault-clearing short-circuit capability, and class H insulation. The alternator electrical insulation system is UL1446 Recognized.

**Permanent Magnet Generator (PMG)** - Offers enhanced motor starting and fault-clearing short circuit capability.

**Control System** - The PowerCommand electronic control is standard equipment and provides total genset system integration, including automatic remote starting/stopping, precise frequency and voltage regulation, alarm and status message display, AmpSentry<sup>™</sup> protection, output metering, auto-shutdown at fault detection, and NFPA 110 compliance. PowerCommand control is Listed to UL508.

**Cooling System** - Provides reliable running at the rated power level, at up to 50°C ambient temperature.

**Structural Steel Skid Base** - Robust skid base supports the engine, alternator, and radiator.

**E-Coat Finish** - Dual electro-deposition paint system provides high resistance to scratching, corrosion, and fading.

**Enclosures** - Optional weather-protective enclosures are available.

**Certifications** - Generator sets are designed, manufactured, tested, and certified to relevant UL, NFPA, ISO, IEC, and CSA standards.

**Warranty and Service** - Backed by a comprehensive warranty and worldwide distributor network.

## Generator Set

The general specifications provide representative configuration details. Consult the outline drawing for installation design.

### Specifications – General

See outline drawing 500-3070 for installation design specifications.

<b>Unit Width, in (mm)</b>	60.0 (1524)
<b>Unit Height, in (mm)</b>	77.6 (1971)
<b>Unit Length, in (mm)</b>	160.0 (4064)
<b>Unit Dry Weight, lb (kg)</b>	11000 (4990)
<b>Unit Wet Weight, lb (kg)</b>	11400 (5171)
<b>Rated Speed, rpm</b>	1800
<b>Voltage Regulation, No Load to Full Load</b>	±0.5%
<b>Random Voltage Variation</b>	±0.5%
<b>Frequency Regulation</b>	Isochronous
<b>Random Frequency Variation</b>	±0.25%
<b>Radio Frequency Interference</b>	IEC 801.2, Level 4 Electrostatic Discharge IEC 801.3, Level 3 Radiated Susceptibility IEC 801.4, Level 4 Electrical Fast Transients IEC 801.5, Level 5 Voltage Surge Immunity MIL STD 461C, Part 9 Radiated Emissions (EMI)

Cooling	Standby	Prime
Fan Load, HP (kW)	22.6 (16.9)	22.6 (16.9)
Coolant Capacity with radiator, US Gal (L)	24.0 (90.8)	24.0 (90.8)
Coolant Flow Rate, Gal/min (L/min)	196.0 (741.9)	196.0 (741.9)
Heat Rejection To Coolant, Btu/min (MJ/min)	16350.0 (17.3)	14350.0 (15.2)
Heat Radiated To Room, Btu/min (MJ/min)	6100.0 (6.5)	5540.0 (5.9)
Maximum Coolant Friction Head, psi (kPa)	10.0 (68.9)	10.0 (68.9)
Maximum Coolant Static Head, ft (m)	60.0 (18.3)	60.0 (18.3)

Air	Standby	Prime
Combustion Air, scfm (m <sup>3</sup> /min)	1517.0 (42.9)	1455.0 (41.2)
Alternator Cooling Air, scfm (m <sup>3</sup> /min)	4156.0 (117.6)	4156.0 (117.6)
Radiator Cooling Air, scfm (m <sup>3</sup> /min)	27200.0 (769.8)	27200.0 (769.8)
Max. Static Restriction, in H <sub>2</sub> O (Pa)	0.5 (124.5)	0.5 (124.5)

### Rating Definitions

**Standby Rating based on:** Applicable for supplying emergency power for the duration of normal power interruption. No sustained overload capability is available for this rating. (Equivalent to Fuel Stop Power in accordance with ISO3046, AS2789, DIN6271 and BS5514). Nominally rated.

**Prime (Unlimited Running Time) Rating based on:** Applicable for supplying power in lieu of commercially purchased power. Prime power is the maximum power available at a variable load for an unlimited number of hours. A 10% overload capability is available for limited time. (Equivalent to Prime Power in accordance with ISO8528 and Overload Power in accordance with ISO3046, AS2789, DIN6271, and BS5514). This rating is not applicable to all generator set models.

**Base Load (Continuous) Rating based on:** Applicable for supplying power continuously to a constant load up to the full output rating for unlimited hours. No sustained overload capability is available for this rating. Consult authorized distributor for rating. (Equivalent to Continuous Power in accordance with ISO8528, ISO3046, AS2789, DIN6271, and BS5514). This rating is not applicable to all generator set models.

### Site Derating Factors

Rated power available up to 5500 ft (1678 m) at ambient temperatures up to 104°F (40°C). Above 5500 ft (1678 m), derate at 4% per 1000 ft (305 m) and 1% per 10°F (2% per 11°C) above 104°F (40°C).



# Engine

Cummins heavy duty diesel engines use advanced combustion technology for reliable and stable power, low emissions, and fast response to sudden load changes.

Electronic governing provides precise speed regulation, especially useful for applications requiring constant (isochronous) frequency regulation such as Uninterruptible Power Supply (UPS) systems, non-linear loads, or sensitive electronic loads. Optional coolant heaters are recommended for all emergency standby installations or for any application requiring fast load acceptance after start-up.

## Specifications – Engine

<b>Base Engine</b>	Cummins Model KTA19-G4, Turbocharged and Aftercooled, diesel-fueled
<b>Displacement in<sup>3</sup> (L)</b>	1150.0 (18.8)
<b>Overspeed Limit, rpm</b>	2100 ±50
<b>Regenerative Power, kW</b>	63.00
<b>Cylinder Block Configuration</b>	Cast iron with replaceable wet cylinder liners, In-line 6 cylinder
<b>Battery Capacity</b>	610 amps minimum at ambient temperature of 32°F (0°C)
<b>Battery Charging Alternator</b>	55 amps
<b>Starting Voltage</b>	24-volt, negative ground
<b>Lube Oil Filter Types</b>	Two spin-on, full flow
<b>Standard Cooling System</b>	122°F (50°C) ambient radiator

<b>Power Output</b>	<b>Standby</b>	<b>Prime</b>							
Gross Engine Power Output, bhp (kWm)	755.0 (563.2)	675.0 (503.6)							
BMEP at Rated Load, psi (kPa)	280.0 (1930.5)	256.0 (1765.1)							
Bore, in. (mm)	6.25 (158.8)	6.25 (158.8)							
Stroke, in. (mm)	6.25 (158.8)	6.25 (158.8)							
Piston Speed, ft/min (m/s)	1875.0 (9.5)	1875.0 (9.5)							
Compression Ratio	13.9:1	13.9:1							
Lube Oil Capacity, qt. (L)	48.0 (45.4)	48.0 (45.4)							
<b>Fuel Flow</b>									
Fuel Flow at Rated Load, US Gal/hr (L/hr)	58.0 (219.5)	58.0 (219.5)							
Maximum Inlet Restriction, in. Hg (mm Hg)	4.0 (101.6)	4.0 (101.6)							
Maximum Return Restriction, in. Hg (mm Hg)	6.5 (165.1)	6.5 (165.1)							
<b>Air Cleaner</b>									
Maximum Air Cleaner Restriction, in. H <sub>2</sub> O (kPa)	25.0 (6.2)	25.0 (6.2)							
<b>Exhaust</b>									
Exhaust Flow at Rated Load, cfm (m <sup>3</sup> /min)	3945.0 (111.6)	3673.0 (103.9)							
Exhaust Temperature, °F (°C)	939.0 (503.9)	898.0 (481.1)							
Max Back Pressure, in. H <sub>2</sub> O (kPa)	41.0 (10.2)	41.0 (10.2)							
<b>Fuel System</b>	Direct injection, number 2 diesel fuel; fuel filter; automatic electric fuel shutoff								
<b>Fuel Consumption</b>									
<b>60 Hz Ratings, kW (kVA)</b>	<b>Standby</b> <b>500 (625)</b>				<b>Prime</b> <b>455 (569)</b>				
	Load	1/4	1/2	3/4	Full	1/4	1/2	3/4	Full
	US Gal/hr	10.1	18.0	25.9	34.0	9.6	17.0	24.3	31.1
	L/hr	38	68	98	129	36	64	92	118

## Alternator

Several alternators are available for application flexibility based on the required motor-starting kVA and other requirements. Larger alternator sizes have lower temperature rise for longer life of the alternator insulation system. In addition, larger alternator sizes can provide a cost-effective use of engine power in across-the-line motor-starting applications and can be used to minimize voltage waveform distortion caused by non-linear loads.

Single-bearing alternators couple directly to the engine flywheel with flexible discs for drivetrain reliability and durability. No gear reducers or speed changers are used. Two-thirds pitch windings eliminate third-order harmonic content of the AC voltage waveform and provide the standardization desired for paralleling of generator sets. The standard excitation system is a PMG excited system.

## Alternator Application Notes

**Separately Excited Permanent Magnet Generator (PMG) System** - This standard system uses an integral PMG to supply power to the voltage regulator. A PMG system generally has better motor-starting performance, lower voltage dip upon load application, and better immunity from problems with harmonics in the main alternator output induced by non-linear loads. This system provides improved performance over self-excited regulators in applications that have large transient loads, sensitive electronic loads (especially UPS applications), harmonic content, or that require sustained short-circuit current (sustained 3-phase short circuit current at approximately 3 times rated for 10 seconds).

**Alternator Sizes** - On any given model, various alternator sizes are available to meet individual application needs. Alternator sizes are differentiated by maximum winding temperature rise, at the generator set standby or prime rating, when operated in a 40°C ambient environment. Available temperature rises range from 80°C to 150°C. Not all temperature rise selections are available on all models. Lower temperature rise is accomplished using larger alternators at lower current density. Lower temperature rise alternators have higher motor-starting kVA, lower voltage dip upon load application, and they are generally recommended to limit voltage distortion and heating due to harmonics induced by non-linear loads.

**Alternator Space Heater** - is recommended to inhibit condensation.

## Available Output Voltages

### Three Phase Reconnectable

- 110/190
- 115/200
- 120/208
- 127/220
- 139/240
- 120/240
- 220/380
- 240/416
- 254/440
- 277/480

### Three Phase Non-Reconnectable

- 277/480
- 347/600

# Specifications – Alternator

<b>Design</b>	Brushless, 4-pole, drip-proof revolving field
<b>Stator</b>	2/3 pitch
<b>Rotor</b>	Direct-coupled by flexible disc
<b>Insulation System</b>	Class H per NEMA MG1-1.65 and BS2757
<b>Standard Temperature Rise</b>	125°C standby
<b>Exciter Type</b>	Permanent Magnet Generator (PMG)
<b>Phase Rotation</b>	A (U), B (V), C (W)
<b>Alternator Cooling</b>	Direct-drive centrifugal blower
<b>AC Waveform Total Harmonic Distortion</b>	<5% total no load to full linear load <3% for any single harmonic
<b>Telephone Influence Factor (TIF)</b>	<50 per NEMA MG1-22.43.
<b>Telephone Harmonic Factor (THF)</b>	<3

Three Phase Table <sup>1</sup>		80° C	105° C	105° C	125° C	125° C	125° C	125° C					
Feature Code		B302	B259	B301	B258	B252	B246	B300					
Alternator Data Sheet Number		308	308	307	307	307	306	306					
Voltage Ranges		347/600	110/190 Thru 139/240 220/380 Thru 277/480	347/600	110/190 Thru 139/240 220/380 Thru 277/480	120/208 Thru 139/240 240/416 Thru 277/480	277/480	347/600					
Surge kW		521	517	520	515	517	517	517					
Motor Starting kVA (at 90% sustained voltage)	PMG	2429	2429	2208	2208	2208	1896	1896					
Full Load Current - Amps at Standby Rating		<u>120/208</u> 1735	<u>127/220</u> 1640	<u>139/240</u> 1504	<u>220/380</u> 950	<u>240/416</u> 867	<u>254/440</u> 820	<u>277/480</u> 752	<u>347/600</u> 601				

**Notes:**

**1. Single Phase Capability:** Single phase power can be taken from a three phase generator set at up to 40% of the generator set nameplate kW rating at unity power factor.

# Control System



Optional Features Shown

<b>PowerCommand® Control with AmpSentry™ Protection</b>	
<ul style="list-style-type: none"> <li>• AmySentry Protection guards the electrical integrity of the alternator and power system from the effects of overcurrent, over/under voltage, under frequency and overload conditions.</li> <li>• Control components are designed to withstand the vibration levels typical in generator sets.</li> <li>• Integrated automatic voltage regulator and engine speed governor</li> </ul>	
<b>Standard Control Description</b>	
<ul style="list-style-type: none"> <li>• Analog % of current meter (amps)</li> <li>• Analog % of load meter (kW)</li> <li>• Analog AC frequency meter</li> <li>• Analog AC voltage meter</li> <li>• Cycle cranking control</li> <li>• Digital display panel</li> <li>• Emergency stop switch</li> <li>• Idle mode control</li> <li>• Menu switch</li> </ul>	<ul style="list-style-type: none"> <li>• Panel backlighting</li> <li>• Remote starting, 24 V, 2 wire</li> <li>• Reset switch</li> <li>• Run-Off-Auto switch</li> <li>• Sealed front panel, gasketed door</li> <li>• Self diagnostics</li> <li>• Separate customer interconnection box</li> <li>• Voltmeter/Ammeter phase selector switch</li> </ul>

Standard Protection Functions		Standard Performance Data
<b>Warnings</b> <ul style="list-style-type: none"> <li>• High coolant temperature</li> <li>• High DC voltage</li> <li>• Low coolant temperature</li> <li>• Low DC voltage</li> <li>• Low fuel-day tank</li> <li>• Low oil pressure</li> <li>• Oil pressure sender fault</li> <li>• Overcurrent</li> <li>• Overload load shed contacts</li> <li>• Temperature sender fault</li> <li>• Up to four customer fault inputs</li> <li>• Weak battery</li> </ul>	<b>Shutdowns</b> <ul style="list-style-type: none"> <li>• Emergency stop</li> <li>• Fail to crank</li> <li>• High AC voltage</li> <li>• High coolant temperature</li> <li>• Low AC voltage</li> <li>• Low coolant level (option for alarm only)</li> <li>• Low oil pressure</li> <li>• Magnetic pickup failure</li> <li>• Overcrank</li> <li>• Overcurrent</li> <li>• Overspeed</li> <li>• Short circuit</li> <li>• Underfrequency</li> </ul>	<b>AC Alternator</b> <ul style="list-style-type: none"> <li>• Current by phase</li> <li>• Kilowatts</li> <li>• Kilowatt hours</li> <li>• Power factor</li> <li>• Voltage line to line</li> <li>• Voltage line to neutral</li> </ul> <b>Engine Data</b> <ul style="list-style-type: none"> <li>• Battery voltage</li> <li>• Coolant temperature</li> <li>• Engine running hours</li> <li>• Engine starts counter</li> <li>• Oil pressure</li> <li>• Oil temperature</li> <li>• RPM</li> </ul>

## Generator Set Options

### Engine

- 208/240/480 V thermostatically controlled coolant heater for ambient above 40°F (4.5°C)
- 208/240/480 V thermostatically controlled coolant heater for ambient below 40°F (4.5°C)
- 120 V 300 W lube oil heater
- 208/240 V 300 W lube oil heater
- 480 V 300 W lube oil heater
- Bypass oil filter
- Fuel/water separator
- Heavy-duty air cleaner with safety element

### Cooling System

- Heat exchanger cooling
- Remote radiator cooling

### Alternator

- 80°C rise alternator
- 105°C rise alternator
- 120/240 V, 300 W anti-condensation heater

### Control Panel

- 120/240 V, 100 W control anti-condensation space heater
- Exhaust pyrometer
- Fuel-pressure gauge (engine mounted)
- Ground fault alarm
- Remote fault signal package
- Run relay package

### Exhaust System

- Critical-grade exhaust silencer
- Exhaust packages
- Industrial-grade exhaust silencer
- Residential-grade exhaust silencer

### Generator Set

- AC entrance box
- Batteries
- Battery charger
- Export box packaging
- UL2200 Listed
- Main line circuit breaker
- Paralleling accessories
- Remote annunciator panel
- Spring isolators
- Weather-protective enclosure with mounted silencer
- 2-year standby warranty
- 2-year prime power warranty
- 5-year basic power warranty
- 5-year comprehensive power warranty
- 10-year major components warranty

## Available Products and Services

A wide range of products and services is available to match your power generation system requirements. Cummins Power Generation products and services include:

Diesel and Spark-Ignited Generator Sets

Transfer Switches

Bypass Switches

Parallel Load Transfer Equipment

Digital Paralleling Switchgear

PowerCommand Network and Software

Distributor Application Support

Planned Maintenance Agreements

## Warranty

All components and subsystems are covered by an express limited one-year warranty. Other optional and extended factory warranties and local distributor maintenance agreements are available. Contact your distributor/dealer for more information.

## Certifications



**ISO9001** - This generator set was designed and manufactured in facilities certified to ISO9001.



**CSA** - This generator set is CSA certified to product class 4215-01.



**PTS** - The Prototype Test Support (PTS) program verifies the performance integrity of the generator set design. Products bearing the PTS symbol have been subjected to demanding tests in accordance to NFPA 110 to verify the design integrity and performance under both normal and abnormal operating conditions including short circuit, endurance, temperature rise, torsional vibration, and transient response, including full load pickup.



**UL** - The generator set is available Listed to UL2200, Stationary Engine Generator Assemblies. The PowerCommand control is Listed to UL508 - Category NITW7 for U.S. and Canadian usage.

**See your distributor for more information**



**Cummins Power Generation**  
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[www.cumminspower.com](http://www.cumminspower.com)

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Detector and AmpSentry are trademarks of Cummins Inc.

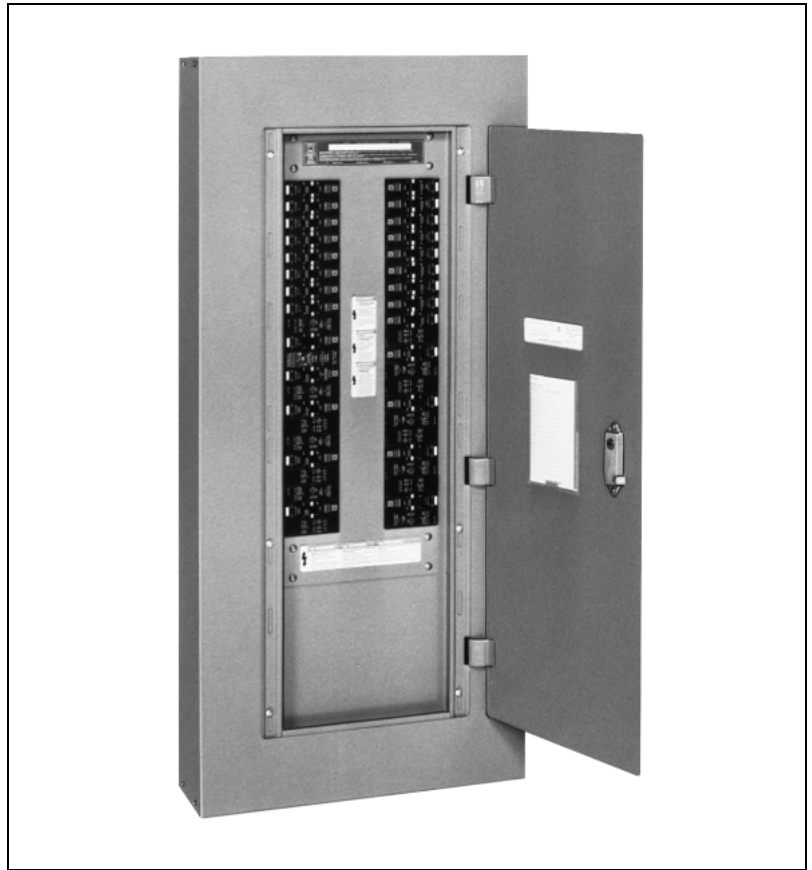
**Important: Backfeed to a utility system can cause electrocution and/or property damage. Do not connect generator sets to any building electrical system except through an approved device or after building main switch is open.**

# NF Circuit Breaker Panelboards

Catalog

# 05

Class 1670



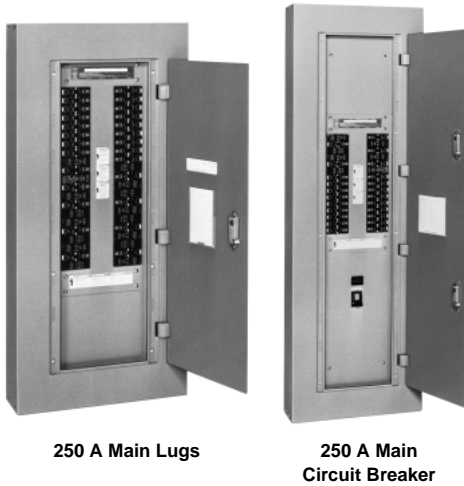
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# NF Standard Width Panelboards

## Application Data



### Type

NF circuit breaker panelboards are for use on ac systems. They are UL® Listed under File E33139. NF circuit breaker panelboards accept EDB, EGB, and EJB branch circuit breakers.

### Standards

NF circuit breaker panelboards are designed, manufactured, and tested to comply with the following standards:

- UL 67—Standard for Panelboards
- UL 50—Enclosures for Electrical Equipment
- UL Listed Class CTL panelboard
- CSA C22.2, No. 29-1989—Panelboards and Enclosed Panelboards
- NEMA PB 1—Panelboards
- NFPA 70—National Electrical Code® (NEC®)
- Federal Specification W-P-115C Type I Class 1—Circuit Breaker Panelboards

### Service

Voltage	System	System Diagram
120/240 Vac	1 $\phi$ 3W	
208Y/120 Vac	3 $\phi$ 4W	
240/120 Vac	3 $\phi$ 4W Delta	
240 Vac	3 $\phi$ 3W Delta	
240 Vac	3 $\phi$ 3W Grounded B $\phi$ Delta	
480Y/277 Vac	3 $\phi$ 4W	

### Ratings

- Main lugs: 125–800 A
- Main circuit breaker: 125-600 A

### Branch Circuit Breakers (Bolt-on), 480Y/277 Vac

18,000 AIR, EDB	35,000 AIR, EGB	65,000 AIR, EJB
1-pole, 15–70 A	1-pole, 15–70 A	1-pole, 15–70 A
2-pole, 15–125 A	2-pole, 15–125 A	2-pole, 15–125 A
3-pole, 15–125 A	3-pole, 15–125 A	3-pole, 15–125 A

### NF Panelboard 480Y/277 Vac Short Circuit Current Ratings (SCCR)

SCCR	Fully Rated or Series Rated	Integral Mains (Main Circuit Breaker Maximum Amperage)	Remote Mains (Maximum Amperage)	Branch Circuit Breakers
18,000 A	Fully Rated	EDB (125 A)	FA (100 A), EDB (125 A)	EDB
25,000 A	Fully Rated	—	FH (100 A)	EGB
30,000 A	Fully Rated	LA (400 A)	LA (400 A), MA (800 A)	EGB
35,000 A	Fully Rated	EGB (125 A), HG (150 A), JG (250 A), LH (400 A)	EGB (125 A), HG (150 A), JG (250 A), LH (400 A)	EGB
	Series Rated	EGB (125 A), HG (150 A), JG (250 A), LH (400 A)	EGB (125 A), HG (150 A), JG (250 A), LH (400 A)	EDB
65,000 A	Fully Rated	EJB (125 A), HJ (150 A), JJ (250 A), LC (600 A)	EJB (125 A), HJ (150 A), JJ (250 A), LC (600 A), LX (600 A), MH (800 A)	EJB
	Series Rated	EJB (125 A), HJ (150 A), JJ (250 A), LC (600 A)	EJB (125 A), HJ (150 A), JJ (250 A), LC (600 A), LX (600 A), MH (800 A)	EDB, EGB
100,000 A	Series Rated	HL (150 A), JL (250 A)	Class J/T fuse (400 A max., 600 Vac)	EDB, EGB, EJB
200,000 A	Series Rated	FI (100 A), KI (250 A), LI (600 A)	FI (100 A), KI (250 A), LI (600 A), LXI (600 A), Class J/T fuse (200 A max., 600 Vac)	EDB, EGB, EJB



EDB Branch Circuit Breakers



### Indoor Enclosures (Type 1)



**Mono-Flat Front Type 1**  
for 100–250 A Interiors

#### Enclosures (MH):

- Galvanized steel with removable endwalls. On standard 5 3/4 inch depth enclosures, one endwall is provided with knockouts, and the other endwall is blank. On deeper enclosures, both are blank. Endwalls are removable and interchangeable
- 20 in. (508 mm) wide by 5.75 in. (146 mm) deep, 800 A interior maximum. Depth of interiors with LC/LI main circuit breakers is 8 in. (203 mm). Depth of 800 A is 8.75 in. (223 mm)
- Enclosure and interior mounting instructions are included in the documentation shipped with the interior
- Interiors mount directly to studs in MH enclosures. No interior mounting brackets are required. Exceptions: interiors that have LC/LI main circuit breakers require elevating brackets due to the requirement of an 8 in. (203 mm) deep enclosure. 800 A interiors require elevating brackets due to the requirement of an 8.75 in. (223 mm) deep enclosure. Keyhole slots are located in the enclosure backwall to ease installation

#### Fronts:

- Finished with gray-baked enamel electrodeposited over cleaned, phosphatized steel (ANSI 49)
- Flush or surface mounted
- Door with flush lock; uses NSR-251 key
- Directory card located on the inside of the door
- Mono-Flat® fronts on 100–250 A interiors; mount to the interior trim with trim screws (Catalog No. LP9502). Both trim mounting screws and door hinges are concealed; fronts are not removable with the door closed and locked
- Fronts for 400–800 A interiors are ventilated and mount to the enclosure with trim screws; door hinges are concealed
- Fronts 56 in. (1422 mm) high or more on 250 A interiors or 74 in. (1880 mm) high or more on 600 A and 800 A interiors have two flush locks
- Fronts 68 in. (1727 mm) high or more on interiors with LC/LI main circuit breakers or LC subfeed circuit breakers use a sliding vault lock with 3-point latching



**Type 1 Front for**  
400–800 A Interiors with  
Trim Screws



**MH Box**



**Concealed Hinge Used on**  
100–800 A Fronts



**Interiors Mount Directly to**  
Enclosure Studs



**Key NSR-251**  
(Catalog No. LP9618)



**Flush Lock**  
(Catalog No. PK4FL)



**Sliding Vault Lock**  
(Catalog No. PK5FL)

# NF Standard Width Panelboards

## Application Data



Type 3R, 5, and 12 Enclosures

### Rainproof (Type 3R) Dusttight (Type 5 and 12)

- Finished with gray-baked enamel electrodeposited over cleaned, phosphatized galvanized steel (ANSI 49)
- Gasketed door with lockable vault handle (PK4NVL); uses NSR-251 key
- Directory card located on the inside of the door
- No knockouts in endwalls
- Trim kit included for end and side gutters
- Provisions for two ground bars
- 125 A, 250 A, 400 A main lug and main circuit breaker interiors
- 600 A and 800 A main lug only



Vault Handle with Lock  
(Catalog No. PK4NVL)



Type 3R, 5, and 12 Enclosure

### Corrosion-Resistant Fiberglass-Reinforced Polyester (Type 4X)

- Watertight and dusttight
- Gasketed door with trunk latches
- Directory card located on the inside of the door

### Enclosure Options

Types	Environment	Provides Protection Against
Type 1	Indoor	Contact with the enclosed equipment
Type 3R	Outdoor	Falling rain, sleet; undamaged by ice
Type 4X	Indoor/outdoor	Hose-directed water, dust; resists corrosion
Type 5	Indoor	Settling dust, falling dirt, dripping liquids
Type 12	Indoor	Circulating dust, falling dirt, dripping liquids



Type 4X Enclosure

### Line Lugs

All lugs are suitable for 75 °C copper or aluminum wire.

### Phasing

Distributed phase bussing; branch circuit breakers may be mounted in any position.



Distributed Phase Bussing

### Main Lugs Interiors

- Accepts bolt-on branch circuit breakers
- Top or bottom feed
- 65 k AIR maximum branch circuit breakers at 480Y/277 Vac
- Series rated to 200 k AIR maximum when supplied by remote I-LIMITER® circuit breaker
- 125 A and 250 A are suitable for use as service entrance with back-fed EDB, EGB, or EJB circuit breakers
- Factory-installed main lugs on all interiors
- 125–400 A main lug interiors are convertible to main circuit breaker by adding a main circuit breaker adapter kit and main circuit breaker
- Available with silver-plated copper or tin-plated aluminum bus (aluminum is standard). Tin-plated copper bus is available as an option; 600 A and 800 A only available with copper
- Branch connector fingers are tin-plated copper; silver-plated branch connector fingers are optional



250 A Maximum  
Main Lugs



250 A Maximum Main  
Lugs Trim Installed

### Main Circuit Breaker Interiors

- Accepts bolt-on branch circuit breakers
- Suitable for use as service entrance (statement found on wiring label on rear of deadfront)
- Top or bottom feed
- 65 k AIR maximum branch circuit breakers at 480Y/277 Vac
- Available with silver-plated copper or tin-plated aluminum bus (aluminum is standard). Tin-plated copper bus is available as an option; 600 A only available with copper
- Branch connector fingers are tin-plated copper; silver-plated branch connector fingers are optional
- 200 k AIR with I-Limiter main circuit breaker
- 125 A main circuit breaker interiors contain factory-installed back-fed EDB, EGB, or EJB main circuit breakers
- 100–250 A main circuit breaker interiors use:
  - Standard main lug interiors
  - Main circuit breaker adapter kit (N150MH, N100M-FI, N250MJ)
  - Appropriate FIL, HDL, HGL, HJL, HLL, JDL, JGL, JJJ, JLL, or KIL circuit breakers



125 A EDB Main  
Circuit Breaker



250 A JLL Main  
Circuit Breaker

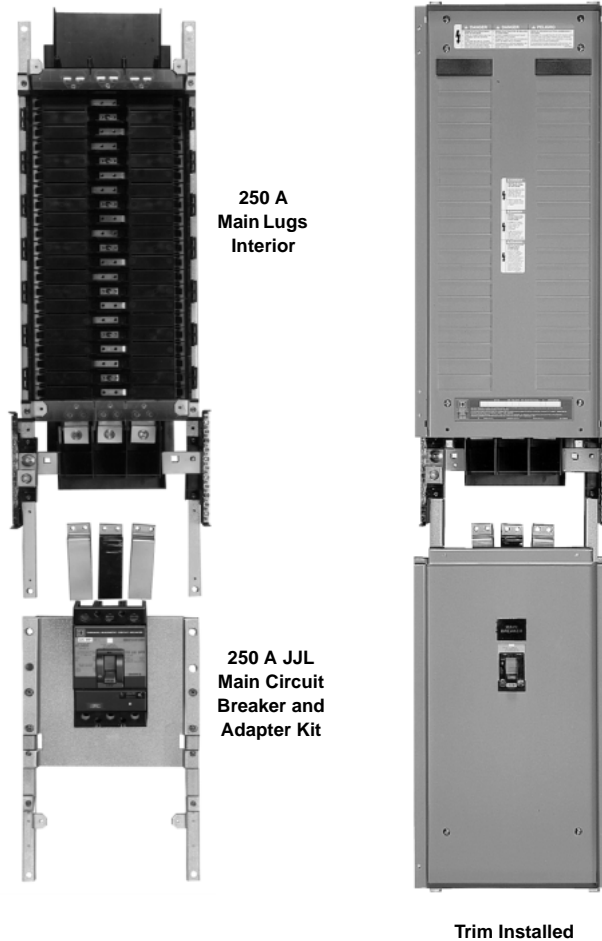


400 A LAL Main Circuit  
Breaker Interior

# NF Standard Width Panelboards Application Data

## Main Circuit Breaker Interiors, continued

- 400 A main circuit breaker interiors use:
  - Standard main lug interior
  - Main circuit breaker adapter kit (N400M)
  - Appropriate LAL or LHL circuit breaker
  - Factory-installed LCL main circuit breaker with 8 in. (203 mm) deep enclosure (Type 1 only)
- 600 A main circuit breaker interiors:
  - Factory assembled only
  - Use LCL, LIL main circuit breakers
  - 8 in. (203 mm) deep enclosure (Type 1 only)



# NF Standard Width Panelboards Application Data



LAL



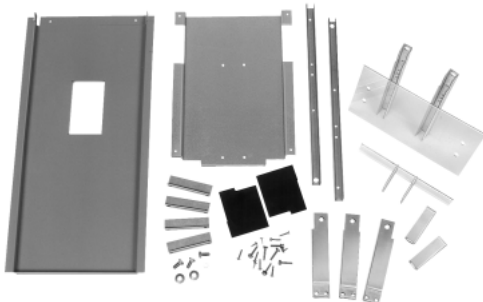
JJL



HJL



N250MJ



N400M

Main Circuit Breaker Adapter Kits  
(Order Circuit Breaker Separately)

## Main Circuit Breakers

- 125 A maximum factory-installed EDB, EGB, or EJB
- 150 A maximum field-installable HDL, HGL, HJL, or HLL
- 250 A maximum field-installable JDL, JGL, JJL, or JLL
- 400 A maximum field-installable LAL or LHL
- 400 A or 600 A maximum factory-installed LCL or LIL

## Additional Main Circuit Breaker Information

Ampere Rating	Circuit Breaker Type	Circuit Breaker Catalog Section Class
125 A	EDB, EGB, EJB	515
100 A	FIL	601
150 A	HDL, HGL, HJL, HLL	611
250 A	JDL, JGL, JJL, JLL	611
400 A	LAL, LCL, LHL, LIL	601
600 A	LCL, LIL	601

## Factory-Installed Accessories

HDL, HGL, HJL, HLL, JDL, JGL, JJL, JLL, and KIL circuit breakers are available with shunt trip, ground fault shunt trip, undervoltage trip, time delay, auxiliary switches, and alarm switches.

## Field-Installable Circuit Breaker Accessories

Field-installable undervoltage release, alarm switch, shunt trip, and auxiliary contacts are available for LAL, LHL, LCL, and LIL 400 A main circuit breaker interiors.

## Main Circuit Breaker Breakerless Adapter Kits

Adapter Kit Catalog Number	Ampere Rating	Main Circuit Breaker ▲
N100M-FI	20–100 A	FIL
N150MH	15–150 A	HDL, HGL, HJL, HLL
N250MJ	150–250 A	JDL, JGL, JJL, JLL
N400M	125–400 A	LAL, LHL

▲ Main circuit breakers are not included in the adapter kits. Order them separately.

## Branch Terminal Lug Data ▲

Ampere Rating	Circuit Breaker Type	Wire Size	
		Aluminum	Copper
15–30 A	EDB, EGB, EJB	#12-#6	#14-#6
35–125 A		#12-2/0	#14-2/0

▲ Lugs are suitable for 75 °C wire.

Torque EDB, EGB, and EJB connector mounting screws to 18–21 lb-in. (2 N•m).

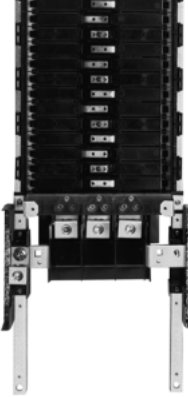
Torque labels with the load side lug torque requirements are included on the circuit breakers.

## Branch Circuit Breaker Interrupting Capacity

Circuit Breaker Frame Type	No. of Poles	Continuous Ampere Rating	UL Listed Interrupting Rating— RMS Symmetrical Amperes				
			AC Volts, 50/60 Hz				
			120	120/240	240	277	480Y/277
EDB	1	15–70 A	25 k	25 k	18 k	18 k	—
	2, 3	15–125 A	25 k	25 k	25 k	—	18 k
EGB	1	15–70 A	65 k	65 k	35 k	35 k	—
	2, 3	15–125 A	65 k	65 k	65 k	—	35 k
EJB	1	15–70 A	100 k	100 k	65 k	65 k	—
	2, 3	15–125 A	100 k	100 k	100 k	—	65 k

# NF Standard Width Panelboards

## Application Data



125-250 A Typical Neutral Assembly



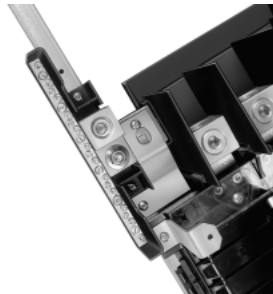
400-800 A Typical Neutral Assembly

### Neutral Assembly

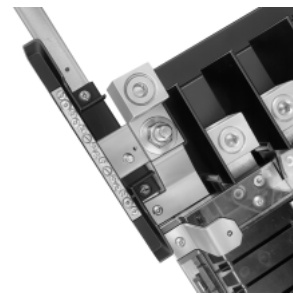
- All lugs are suitable for copper or aluminum wire
- 125-250 A interiors have a split neutral located on the same end as the mains
- 400-800 A interior neutrals can be located on either end depending on the configuration
- Neutral may be bonded for use as a service entrance
- Branch terminals are suitable for #14-2/0 copper or aluminum and #14-#6 copper or aluminum
- Provisions for larger branch terminal lug kits
- Suitable lug provided on neutrals for termination of the grounding conductor
- All unused neutral terminals may be used to terminate equipment grounding conductors when the panelboard is used as service equipment
- 100% rated neutrals are standard; one neutral termination provided per circuit in the panelboard
- 200% rated neutrals are optional

### Neutral Bonding Provisions

The bonding strap may be field installed for UL service equipment requirements on 125-800 A interiors.



125-250 A



400-800 A

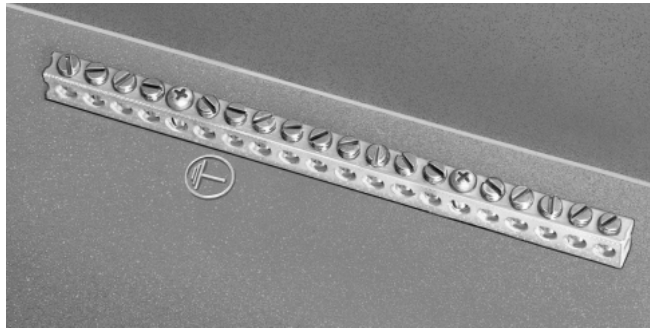
Neutral Bonding Provisions



## Ground Bar Kits

- Field installable in all panelboards
- Suitable for copper or aluminum wire
- Wire size of terminals (refer to the technical information and wire range tables at the bottom of this page).

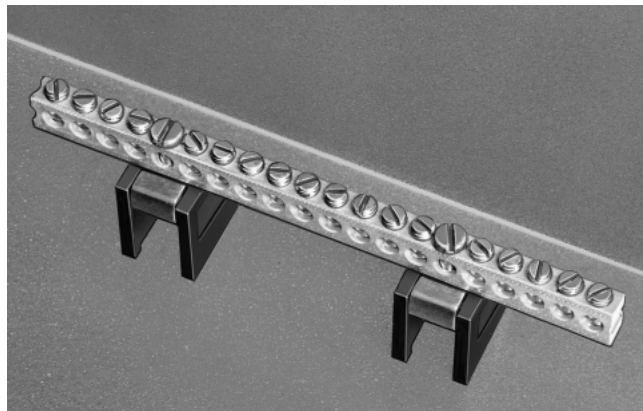
Number of Circuits	Maximum Ampere Rating	Catalog Number
12	250 A	PK9GTA
18	250 A	PK12GTA
30	250 A	PK18GTA
54	250 A	PK23GTA
54	800 A	PK27GTA



Enclosure with Equipment Ground Bar

## Ground Bar Insulator Kit (Catalog No. PKGTAB)

- The insulator kit is for use with standard panelboard ground bar kits to isolate the ground bar from the panelboard.
- The insulator kit is field installable. It may also be used with equipment ground since panelboard enclosures have ground bar mounting provisions in all four corners.



Ground Bar with Insulator Kit

## Ground Bar Kit Technical Information

All PK equipment grounding kits are supplied with mounting screws, installation instructions, and an "Equipment Grounding Terminal" self-adhesive label.

Catalog Number	Total Qty.	Terminals		Approximate Overall Length in. (mm)	Distance Between Mounting Holes in. (mm)
		Quantity Each Size (see table below for wire range)			
		I	II		
PK9GTA	9	9	—	3.125 (79)	3.125 (79)
PK12GTA	12	12	—	4.5 (114)	3.125 (79)
PK15GTA	15	15	—	5.3125 (135)	3.125 (79)
PK15GTA-L	16	15	1	7.25 (184)	3.125 (79)
PK18GTA	18	18	—	6.375 (162)	3.125 (79)
PK18GTA-L	19	18	1	8.5 (216)	3.125 (79)
PK23GTA	23	23	—	7.875 (200)	3.125 (79)
PK23GTA-L	24	23	1	9.125 (232)	3.125 (79)
PK27GTA	27	27	—	9.125 (232)	3.125 (79)

## Wire Range

Size	Cu	Al
I	(1) #14 to #4 or (2) #14 or #12	(1) #12 to #4 or (2) #12 or #10
II	(1) #1 to 4/0	(1) #1 to 4/0

# NF Standard Width Panelboards

## Application Data



125 A EDB  
Main Circuit Breaker



250 A JLL  
Main Circuit Breaker



400 A LAL  
Main Circuit Breaker

### Main Lugs Terminal Data

#### Standard Mechanical Lugs

Panelboard Type	Ampere Rating	Wire Range—Wire Bending Space per NEC Table 373-6	Lug Wire Range
NF	125 A	(1) #6-250 kcmil Al/Cu ▲	(1) #6-350 kcmil Al/Cu ▲
	250 A	(1) #6-350 kcmil Al/Cu	(1) #6-350 kcmil Al/Cu
	400 A	(1) 1/0-750 kcmil Al/Cu or (2) 1/0-350 kcmil Al/Cu	(1) 1/0-750 kcmil Al/Cu or (2) 1/0-350 kcmil Al/Cu
	600 A	(2) 1/0-600 kcmil Al/Cu	(2) 1/0-750 kcmil Al/Cu
	800 A	(3) 4/0-500 kcmil Al/Cu	(3) 4/0-500 kcmil Al/Cu

▲ Neutral accepts #6-2/0 Al/Cu.

#### Compression Lugs

Panelboard Type	Ampere Rating	Catalog No.	Lug Wire Range
NF	125 A	NALV1	(1) #4-300 kcmil Al/Cu
	250 A	NALV2	(1) 250-350 kcmil Al/Cu
	400 A	NALV4	(2) 2/0-500 kcmil Al/Cu
	600 A	NALV6	(2) 2/0-500 kcmil Al/Cu
	800 A	NALV8	(3) 2/0-500 kcmil Al/Cu

### Main Circuit Breaker Terminal Data

#### Standard Mechanical Lugs

Panelboard Type	Ampere Rating	Circuit Breaker Type	Wire Range—Wire Bending Space per NEC Table 373-6	Lug Wire Range
NF	100 A	FIL	(1) #14-1/0 Cu or (1) #12-1/0 Al	(1) #14-1/0 Cu or (1) #12-1/0 Al
	125 A	EDB, EGB, EJB	(1) #14-2/0 Al/Cu	(1) #14-2/0 Al/Cu
	150 A	HDL, HGL, HJL, HLL	(1) #14-3/0 Al/Cu	(1) #14-3/0 Al/Cu
	250 A	JDL, JGL, JLL, JLL	(1) 3/0-350 kcmil Al/Cu	(1) 3/0-350 kcmil Al/Cu
	400 A	LAL, LHL	(1) #1-600 kcmil Al/Cu or (2) #1-250 kcmil Al/Cu	(1) #1-600 kcmil Al/Cu or (2) #1-250 kcmil Al/Cu
	600 A	LCL, LIL, LEL, LXL LXIL	(2) 4/0-500 kcmil Al/Cu	(2) 4/0-500 kcmil Al/Cu
	800 A	800 A main breaker panelboard not available.		

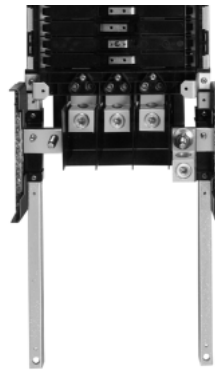
#### Compression Lugs

Panelboard Type	Ampere Rating	Circuit Breaker Type	Catalog No.	Lug Wire Range
NF	100 A	FC, FI	VC100FA	(1) #8-1/0 Al/Cu
	125 A	ED, EG, EJ	VC100FD	(1) #8-1/0 Al/Cu
	150 A	HDL, HGL, HJL, HLL	YA150HD	(1) #1-4/0 Al/Cu
	250 A	JDL, JGL, JLL, JLL	YA250J35	(1) 3/0-350 kcmil Al/Cu
	250 A	KI	VC250KA3	(1) #4-300 kcmil Al/Cu
	400 A	LA, LH	VC400LA5 ▲	(1) 2/0-500 kcmil Al/Cu
	600 A	LC, LI, LE, LX, LXI	—	—
800 A	800 A main breaker panelboard not available.			

▲ Other lug sizes available.



125-250 A Main Lugs



600 A Main Lugs

### Versa-Crimp® Compression Lugs

Compression lugs are available for 125-600 A main lug interiors and 100-400 A main circuit breaker interiors.



Type VCEL VERSAtile™ Compression Equipment Terminals





3 $\phi$ , 30 Circuit, 400 A  
Main Lug Interior with  
Sub-Feed Lugs



3 $\phi$ , 30 Circuit, 400 A  
Main Lug Interior with  
HJL Sub-Feed  
Circuit Breakers



3 $\phi$ , 30 Circuit, 400 A  
Main Lug Interior with  
Feed-Thru Lugs

## Field-Installable Options

- Feed-Thru Lugs  
N125FTL, N250FTL, N400FTL available for 125–400 A, 1 $\phi$  or 3 $\phi$  interiors
- Sub-Feed Circuit Breakers
  - N250SFBJ allows a single sub-feed JDL, JGL, JLL, or JLL circuit breaker on 250 A interiors
  - N600SFBJ allows twin sub-feed JDL, JGL, JLL, or JLL circuit breakers on 400 A main lug or main circuit breaker interiors and 600 A main lug interiors
- Sub-Feed Main Lugs  
125 A–NF125SFL, 250 A–NF250SFL, 400 A–NF400SFL available for use on 1 $\phi$  or 3 $\phi$  main lug 125–400 A interiors



250 A Sub-Feed Main Lugs

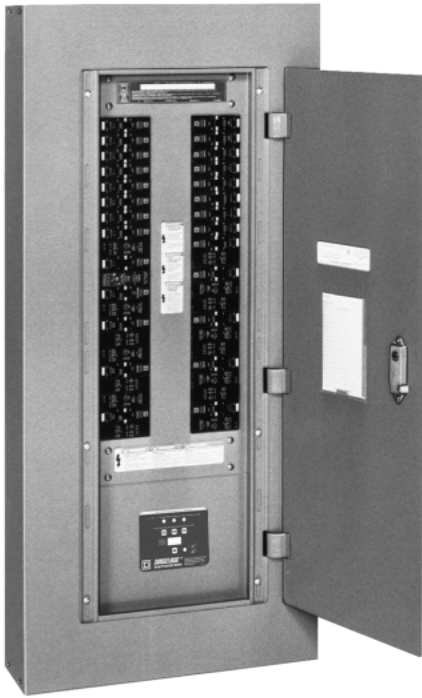
## Factory-Installed Options

- Sub-Feed Lugs (on the Main)  
Available on 1 $\phi$  or 3 $\phi$ , 125–800 A main lug interiors only
- Feed-Thru Lugs  
Available on 1 $\phi$  or 3 $\phi$ , 125–800 A main lug or 100–600 A main circuit breaker interiors
- Sub-Feed Circuit Breakers  
Available on 1 $\phi$  or 3 $\phi$ , 125–800 A main lug or 125–600 A main circuit breaker interiors
  - One sub-feed HDL, HGL, HJL, HLL, JDL, JGL, JLL, or JLL circuit breaker per 250 A panelboard
  - Two sub-feed HDL, HGL, HJL, HLL, JDL, JGL, JLL, or JLL circuit breakers per 400 A panelboard
  - One sub-feed LA, LH, or LC circuit breaker (400 A maximum) and one HDL, HGL, HJL, HLL, JDL, JGL, JLL, or JLL circuit breaker, or two sub-feed HDL, HGL, HJL, HLL, JDL, JGL, JLL, or JLL circuit breakers per 600 A or 800 A panelboard

## Other Available Accessories

- Split bus
- Lighting contactors
- Compression lugs
- Copper bus
- Phenolic nameplates

# NF Standard Width Panelboards Application Data



NF Main Lugs Only (Entire TVSS Interior)

## Design Features

- Individually fused suppression modules
- Thermal cutout
- Inline, copper bus bar connection
- Solid state bi-directional
- Push-to-Test on-line diagnostic display
- Audible alarm with enable/disable switch
- LED indicators indicate loss of protection, or fully operational circuit
- High-energy parallel design for IEEE C62.41 category A, B, and C3 applications
- Available in main circuit breaker and main lug only panelboards with sub-feed circuit breakers, feed-thru lugs, or sub-feed lugs.
- AC tracking filter with EMI/RFI filtering up to -50 dB from 100 kHz to 100 MHz

## Performance Features

Surge Capacity	L-N	L-G	N-G (3-phase rating)
120 kA / phase	60 kA	60 kA	120 kA
160 kA / phase	80 kA	80 kA	120 kA
240 kA / phase	120 kA	120 kA	120 kA

## SurgeLogic™ Surge Protective Device

The SurgeLogic IMA series surge protective device is a modular parallel transient voltage surge suppressor (TVSS). The IMA device is a multi-stage suppression circuit consisting of field-proven, fast-acting, 34 mm metal oxide varistors (MOVs).

A surge suppression path is provided for each mode, line-to-neutral (L-N), line-to-line (L-L), line-to-ground (L-G), and neutral-to-ground (N-G). Each surge suppression mode is individually fused and uses circuitry with thermal cutouts to isolate the TVSS and ensure shutdown in the event of MOV damage during severe overvoltages, even when operated on high fault current power systems.

The suppression elements are encapsulated in a UL® recognized potting material—another performance element that provides additional protection. A filter provides a high level of EMI/RFI noise attenuation. On-line diagnostics continuously monitor the device status, and LEDs signal loss of a suppression circuit. An audible alarm with an enable/disable feature and dry contacts are included in the standard diagnostic package.

IMA Series Voltage Specifications		UL Suppression Voltage Rating (SVR)				
Catalog Number*	Service Voltage	L-N	L-G	N-G	L-L	MCOV ▲
TVS1IMA_P*	120/240 Vac, 1-phase	400	400	400	800	150
TVS2IMA_P*	208Y/120 Vac, 3-phase, 4-wire	400	400	400	800	150
TVS3IMA_P*	240/120 Vac, 3-phase, high-leg delta	800/400	800/400	400	1500/800	275/150
TVS4IMA_P*	480Y/277 Vac, 3-phase, 4-wire	800	800	800	1600	320
TVS8IMA_P*	600Y/347 Vac 3-phase, 4-wire	1200	1200	1200	2000	420

● Catalog number description: \_ = kA rating; P = panelboard; \* = option

▲ MCOV: maximum continuous operating voltage

## Specifications

Relative Humidity	0 to 95% non-condensing
Operating Frequency	47–63 Hz
Storage Temperature	-40 to +65 °C (-40 to +149 °F)
Operating Temperature	-40 to +65 °C (-40 to +149 °F)
Display Operating Temperature	-10 to +50 °C (+14 to +122 °F)
Standards	C-UL, UL 1449 Second Edition UL Category Section 37.3 (200 kA short-circuit current module rating)
Fusing	Individually fused suppression modules
Audible Alarm	Provides audible indication that there is a loss of protection
Dry Contacts	Provides remote indication of the TVSS device's operating status to a computer interface board or emergency management system

## Other Options

Option	Description	Catalog Number
Surge Counter	Displays the combined total number of transient voltage surges detected from L-G, L-L, L-N, and N-G since the counter was last reset.	C
Remote Monitor	Displays the alarm status of the surge protective device up to 1,000 ft (305 m) away from the unit. This option uses the dry contacts.	TVS12RMU

## Example Calculations:

### PMAC-1-1

$$I = 12.38A$$

$$KVA = (1.73 * 12.38 A * 208V * 1) = 4.46KVA$$

**Total Demand:** 4.46 +0j

**Circuit Breaker Size:** 12.38 A \* 250% = 30.95A → **35A, 1P Breaker**

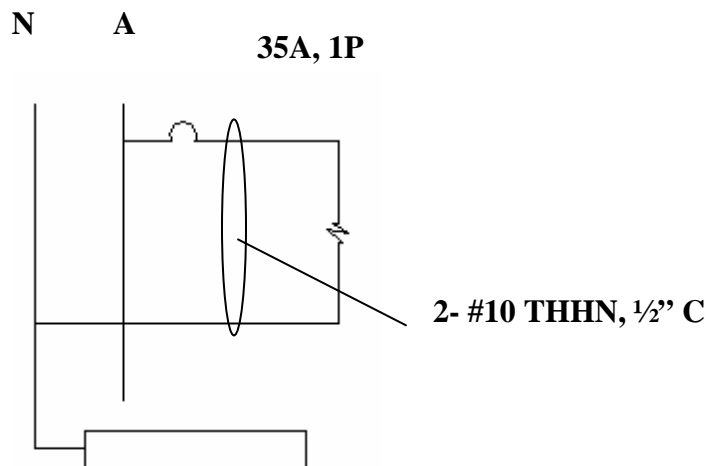
**Conductor Size:** 12.38 A \* 125% = 15.5 A

NEC ARTICLE 310.16 → **#10THHN (Cu)**

#10 THHN (Cu) was required as minimum for the refrigeration equipment

**Conduit Size:**

Text Table 11.6 → ½ “



### FF-FAN-1

$$I = 7A$$

$$KVA = (1.73 * 7 A * 208V * 1) = 4.46KVA$$

**Total Demand:** 4.46 +0j

**Circuit Breaker Size:** 7 A \* 250% = 17.5 A → **20 A, 1P Breaker**

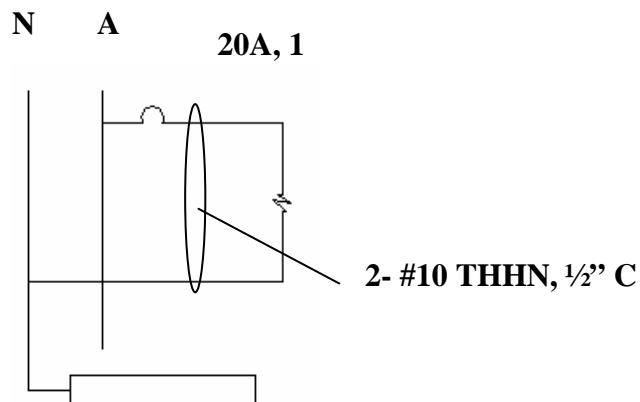
**Conductor Size:** 7 A \* 125% = 8.75 A

NEC ARTICLE 310.16 → **#14 THHN (Cu)**

\*THHN was specified due to refrigeration equipment

**Conduit Size:**

Text Table 11.6 → ½ “



## Panel Board Sizing:

### PPREF1

**Includes:**

$$\text{KVA} = 201.32 \text{ KVA}$$

**Spare Capacity of 20% connected load @ p.f. 0.9**

$$40.26 (\cos(25.84) + \sin(25.84)) = 36.23 + j 17.55 = 40.26 \text{ KVA}$$

**Total KVA = 241.58 KVA**

$$\text{Panel Board Breaker: } I = 241.58 / (1.73 * 0.480 \text{ V}) = 290.58 \text{ A}$$

→ use a 300 A, 3 P Breaker

**Conductor Size: #350MCM THW (310A)** Table 310-16 (NEC)

**Conduit Size: 2 1/2"**

Table 11.6

**Panel size: A**

### LREF1

**Includes:** Refrigeration Equipment and Fans

$$\text{KVA} = 52.3 \text{ KVA}$$

**Spare Capacity of 20% connected load @ p.f. 1.0**

$$10.46 (\cos(90) + \sin(0)) = 10.46 + j 0 = 10.46 \text{ KVA}$$

**Total KVA = 62.76 KVA**

$$\text{Panel Board Breaker: } I = (62.76 * 1000) / (1.73 * 208 \text{ V}) = 174.4 \text{ A}$$

→ use a 250 A, 3 P Breaker

**Conductor Size: #2/0 THHN (260A)** Table 310-16 (NEC)

**Conduit Size: 1-1/2 "**

Table 11.6

**Panel size: 225A**

### LREF1A

**Includes:** Refrigeration Equipment and Fans

$$\text{KVA} = 60.22 \text{ KVA}$$

**Spare Capacity of 20% connected load @ p.f. 1.0**

$$12.05 (\cos(90) + \sin(0)) = 12.05 + j 0 = 12.05 \text{ KVA}$$

**Total KVA = 72.26 KVA**

$$\text{Panel Board Breaker: } I = (72.26 * 1000) / (1.73 * 208 \text{ V}) = 200.8 \text{ A}$$

→ use a 250 A, 3 P Breaker

**Conductor Size: #3/0 THHN (260A)** Table 310-16 (NEC)

**Conduit Size: 1-1/2 "**

Table 11.6

**Panel size: 225A**

## LREF2

**Includes: Refrigeration Equipment and Fans**

**KVA = 61.50 KVA**

**Spare Capacity of 20% connected load @ p.f. 1.0**

$12.3 (\cos(90) + \sin(0)) = 12.3 + j 0 = 12.3 \text{ KVA}$

**Total KVA = 73.8 KVA**

**Panel Board Breaker:  $I = (73.8 * 1000) / (1.73 * 208 \text{ V}) = 204.85 \text{ A}$**

**→ use a 250 A, 3 P Breaker**

**Conductor Size: #3/0 THHN (260A)** Table 310-16 (NEC)

**Conduit Size: 1-1/2 "** Table 11..6

**Panel size: 225A**

## Transformer for PPREF1:

KVA Demand = 81 kVA

Use a 150 kVA transformer

### Overcurrent protection for primary side:

$$\begin{aligned} I_{pri} &= \text{kVA} / (1.73 \times \text{kV}) \\ &= 150 \text{ kVA} / (1.73 \times 0.480 \text{ kV}) \\ &= 180.6 \text{ A} \end{aligned}$$

$$180.6 \times 1.25 = 225.8 \text{ A}$$

Breaker: Use a 250A 3P breaker

Wire: From table 310-16 (4) #4/0 THHN

Conduit: 2" C

### Overcurrent protection for secondary side:

$$\begin{aligned} I_{pri} &= \text{kVA} / (1.73 \times \text{kV}) \\ &= 150 \text{ kVA} / (1.73 \times 0.208 \text{ kV}) \\ &= 416.9 \text{ A} \end{aligned}$$

$$416.9 \text{ A} \times 1.25 = 521.1 \text{ A}$$

Breaker: Use a 600A 3P breaker

Wire: From table 210-16 use two sets of (4)#4/0 THHN

Conduit: 3" C



Joseph Lookup  
Senior Thesis 2005  
Wegmans Fairfax

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# Appendix-3

## Mechanical Appendix



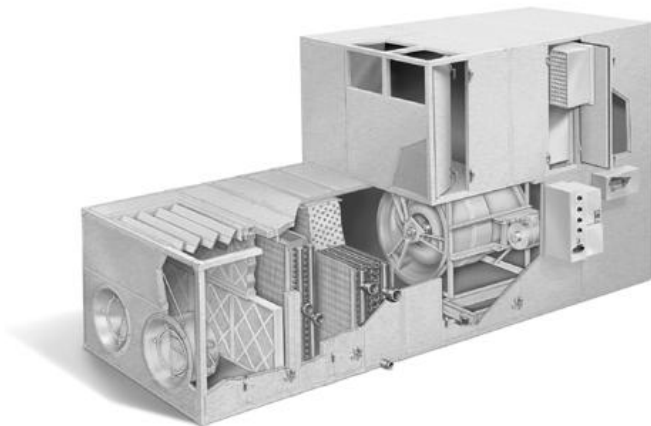
# M-Series Climate Changer™ Air Handler

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## Quick Select for Unit Sizes 3 to 120

### Selection Procedure

- 1 Size the air-handling unit based on airflow through the cooling coil (see Table 2). The unique fin design of Trane coils enables cooling coil selections at velocities in excess of 625 fpm with no moisture carryover. The coil moisture carryover curves from tested data are built into the Trane Official Product Selection System (the TOPSS™ program). Use this system to select coils.
- 2 Choose the coil module (see Table 3). Unit size, coil type, and coil rows determine the minimum coil module size required.
- 3 Select a filter type and check face velocities (see Table 4). The maximum recommended face velocity for pleated media, permanent, bag, and 12-inch cartridge filters is 625 fpm; for throwaway and HEPA filters, it is 500 fpm.
- 4 Design the basic air-handling system. Choose all required sections, including custom modules. Contact your local Trane sales office for more information on custom modules.
- 5 Estimate system static pressure requirements and select a fan (see Figure 5). Refer to M-Series air handler product catalog CLCH-PRC003-EN for pressure drops and catalog CLCH-PRC008-EN for fan curves.
- 6 Total the overall air-handling unit dimensions and weights. Use Table 1 for module dimensions and weights.
- 7 Select a control system. Factory-mounted, -wired, and -tested end devices, starters, VFDs, and direct-digital, interoperable controllers are available to minimize construction cycles and job-site coordination.
- 8 Contact your local Trane sales office to order an air-handling system or to ask questions.





## M-Series Air Handler Quick Select

**Table 1. Module Dimensions (inches) and Weights (pounds)**

- Refer to product catalog CLCH-PRC003-EN for application considerations for M-Series Climate Changer air handlers.
- For each module-to-module connection, add 0.19 inch to the total unit length to account for gasketing.
- These module weights are for double-wall panels.

Nominal airflow <sup>1</sup>	1500	3000	4000	5000	6000	7000	8500	10500	12500	15000	17500	20000	25000	28500	33000	40000	50000	60000	
Airflow at 625 fpm <sup>2</sup>	2169	3475	4338	6075	8331	9025	10938	12500	15000	17500	19963	22569	30206	35938	40625	50419	64238	76388	
Unit size	3	6	8	10	12	14	17	21	25	30	35	40	50	57	66	80	100	120	
Height (inches)	26.25	28.75	34.0	34.0	39.0	40.5	44.0	50.25	56.5	56.5	63.75	63.75	75.0	86.5	92.0	107.0	119.5	119.5	
Width (inches)	31.0	44.0	48.0	60.0	64.0	68.0	74.0	76.0	78.0	91.0	96.0	109.0	120.0	120.0	137.0	137.0	152.0	179.0	
<b>Intake</b>																			
□	Length	15.5	15.50	15.5	15.5	15.5	15.5	15.5	15.5	15.5	16.0	16.0	20.0	20.0	29.5	29.5	29.5	29.5	
	Weight	134	183	221	263	307	332	380	432	485	553	670	747	973	1096	1513	1699	2023	2326
□	Mixing box with filter	36.0 <sup>3</sup>	28.75	34.0	34.0	34.0	34.0	34.0	40.0	40.0	48.0	48.0	48.0	48.0	49.0	54.0	60.0	60.0	
		181	223	277	319	367	390	437	495	577	646	890	982	1158	1290	1589	1798	2133	2387
□	Mixing box without filter	26.25	28.75	34.0	34.0	34.0	34.0	34.0	40.0	40.0	48.0	48.0	48.0	48.0	49.0	54.0	60.0	60.0	
		142	202	253	288	332	341	381	432	512	573	809	891	1051	1143	1410	1575	1847	2056
□	Traq™ mixing box	36.0	28.75	34.0	34.0	34.0	34.0	50.25	40.0	56.5	48.0	48.0	48.0	48.0	84.0	92.0	96.0	96.0	
		159	191	239	275	309	341	376	512	487	676	770	840	978	1056	1743	1936	2161	2328
□	Air Blender® module	26.57	30.07	34.0	34.0	39.0	40.5	34.0	40.0	40.0	48.0	48.0	48.0	48.0	49.0	54.0	60.0	96.0	
		129	174	193	221	297	322	282	309	366	407	507	564	646	700	801	902	1071	1665
□	Filter, angled	26.25	28.75	24.5	24.5	24.5	24.5	24.5	24.5	24.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	
		133	175	178	205	223	260	284	295	312	342	409	457	509	599	852	923	1054	1185
□	Filter, short bag or cartridge-18 in	26.25	28.75	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	
		128	170	168	193	213	243	268	276	295	324	446	495	571	637	857	927	1042	1175
□	Filter, flat	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.5	11.5	14.5	14.5	14.5	14.5	14.5	14.5	
		66	82	94	105	124	134	145	155	164	180	234	255	328	367	562	607	692	779
□	Filter, flat combination	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	16.0	16.0	14.5	14.5	14.5	14.5	14.5	14.5	
		91	116	131	148	178	190	207	219	232	257	287	313	353	397	598	649	745	841
□	Filter, flat, open-return	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	
		11	16	19	22	34	39	43	44	45	53	68	78	99	120	146	169	210	247
<b>Filter, HEPA</b>																			
□	Length	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	
	Weight	185	209	223	251	277	288	310	337	353	383	475	509	573	605	867	891	965	1059
	Height	32.0	32.0	34.0	34.0	41.0	41.0	44.0	53.0	56.5	56.5	66.5	66.5	78.5	86.5	96.5	108.5	119.5	119.5
	Width	31.0	44.0	56.0	70.0	64.0	70.0	82.0	76.0	82.0	96.0	97.0	109.0	120.0	123.0	137.0	137.0	161.0	187.0
□	Filter, long bag-30 in.	36.0	41.0	44.0	34.0	39.0	40.5	44.0	50.25	56.5	56.5	48.0	48.0	48.0	48.0	49.0	54.0	60.0	
		158	218	257	241	292	334	408	443	516	565	586	642	728	793	1104	1244	1464	1635
□	Blank/inspection, small	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.5	11.5	14.5	14.5	14.5	14.5	14.5	14.5	
		65	79	88	99	107	112	121	131	139	150	193	207	265	283	484	495	541	605
□	Blank/access, medium	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	16.0	16.0	n/a	n/a	n/a	n/a	n/a	n/a	
		80	95	105	119	129	136	147	158	168	182	228	244	n/a	n/a	n/a	n/a	n/a	n/a
□	Blank/access, extended medium	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	
		92	109	122	137	150	157	170	182	193	210	262	282	318	339	516	529	575	638
□	Blank/access, medium-large	n/a	n/a	24.5	24.5	24.5	24.5	24.5	24.5	24.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	
		n/a	n/a	151	171	186	195	210	225	238	259	357	384	431	460	669	686	746	828
□	Blank/access/turning, large	26.25	28.75	34.0	34.0	34.0	34.0	34.0	40.0	40.0	48.0	48.0	48.0	48.0	49.0	54.0	60.0	60.0	
		115	152	190	221	240	247	267	290	344	376	514	551	619	659	965	1058	1252	1384
□	Blank/access/turning, extra-large	36.0	41.0	44.0	34.0	39.0	40.5	44.0	50.25	56.5	56.5	63.75	63.75	68.5	68.5	84.0	92.0	96.0	
		141	195	231	212	261	282	326	395	463	502	697	744	873	926	1197	1361	1548	1686
<b>Face-and-bypass, external</b>																			
□	Length	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	16.0	16.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	
	Weight	117	156	185	221	256	271	315	350	385	439	500	548	674	732	1061	1186	1398	1623
	Height	31.25	33.75	39.0	39.0	44.0	45.5	49.0	55.25	61.5	61.5	68.75	68.75	80.0	91.5	97.0	112.0	124.5	124.5
□	Face-and-bypass, Internal	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	16.0	16.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	
		94	127	153	181	213	224	244	293	328	372	453	495	654	734	990	1082	1274	1467
□	Face damper	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	16.0	16.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	
		99	129	156	184	216	228	268	301	335	381	427	468	584	642	905	1030	1223	1415
□	Coil, small with 2-row UW	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.5	11.50	14.5	14.5	14.5	14.5	14.5	14.5	
		108	139	159	186	215	232	256	296	329	370	444	483	625	693	899	1008	1169	1333





## M-Series Air Handler Quick Select

**Table 1. (continued) Module Dimensions (inches) and Weights (pounds)**

Nominal airflow <sup>1</sup>	1500	3000	4000	5000	6000	7000	8500	10500	12500	15000	17500	20000	25000	28500	33000	40000	50000	60000	
Airflow at 625 fpm <sup>2</sup>	2169	3475	4338	6075	8331	9025	10938	12500	15000	17500	19963	22569	30206	35938	40625	50419	64238	76388	
Unit size	3	6	8	10	12	14	17	21	25	30	35	40	50	57	66	80	100	120	
Height (inches)	26.25	28.75	34.0	34.0	39.0	40.5	44.0	50.25	56.5	56.5	63.75	63.75	75.0	86.5	92.0	107.0	119.5	119.5	
Width (inches)	31.0	44.0	48.0	60.0	64.0	68.0	74.0	76.0	78.0	91.0	96.0	109.0	120.0	120.0	137.0	137.0	152.0	179.0	
Coil, medium with 8-row UW	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	16.0	16.0	n/a	n/a	n/a	n/a	n/a	n/a	
Coil, extended-medium with 8-row UW	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	
Coil, Medium-Large with 10-row W	n/a	n/a	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	29.5	29.0	29.5	29.5	29.5	29.5	29.5	29.5	
Coil, Large or Vertical <sup>3</sup> with 10-row W	26.25	28.75	34.0	34.0	34.0	34.0	34.0	34.0	40.0	40.0	48.0	48.0	48.0	48.0	n/a	n/a	n/a	n/a	
Coil, Electric Heat <sup>4</sup>	26.25	28.75	34.0	34.0	34.0	34.0	34.0	34.0	40.0	40.0	48.0	48.0	48.0	48.0	49.0	n/a	n/a	n/a	
Coil, Integral Face-and-Bypass <sup>5</sup>	312	398	500	559	611	677	788	820	1019	1064	1161	1188	1691	1715	1901	2014	2162	2371	
Coil, Multizone/Double-Duct																			
Length	n/a	46.7	46.7	46.7	65.2	65.2	65.2	65.2	71.2	71.2	80.2	80.2	88.2	n/a	n/a	n/a	n/a	n/a	
Weight	n/a	733	818	1031	1303	1384	1511	1719	1897	2139	2718	2993	3818	n/a	n/a	n/a	n/a	n/a	
Height	n/a	45.75	51.0	54.0	59.0	60.5	64.0	73.25	79.5	79.5	91.75	91.75	103.0	n/a	n/a	n/a	n/a	n/a	
Humidifier	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	32.0	32.0	29.0	29.0	29.0	43.5	43.5	43.5	
Moisture Eliminator	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.5	11.5	14.5	14.5	14.5	14.5	14.5	14.5	
Fan <sup>6</sup>	36.0	41.0	44.0	34.0	39.0	40.5	44.0	50.25	56.5	56.5	63.75	63.75	68.5	68.5	84.0	92.0	96.0	96.0	
Diffuser	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	16.0	16.0	20.0	20.0	49.0	54.0	60.0	60.0	
Discharge Plenum, Horizontal	26.25	28.75	34.0	34.0	34.0	34.0	34.0	34.0	40.0	40.0	48.0	48.0	48.0	48.0	49.0	54.0	60.0	60.0	
Discharge Plenum, Vertical																			
Length	36.0	41.0	44.0	34.0	39.0	40.5	44.0	50.25	56.5	56.5	63.75	63.75	68.5	n/a	n/a	n/a	n/a	n/a	
Weight	148	205	249	251	279	296	327	357	428	475	633	689	801	n/a	n/a	n/a	n/a	n/a	
Height	26.25	28.75	34.0	34.0	34.0	34.0	34.0	34.0	40.0	40.0	48.0	48.0	48.0	n/a	n/a	n/a	n/a	n/a	
Silencer, 3 ft.	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	
Silencer, 5 ft.	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	
Energy Wheel																			
Length	29.0	29.0	29.0	45.0	48.0	48.0	50.0	50.0	52.0	57.5	58.0	59.0	67.0	n/a	n/a	n/a	n/a	n/a	
Weight <sup>7</sup>	417	555	617	837	1051	1165	1311	1399	1778	1979	2325	2634	3079	n/a	n/a	n/a	n/a	n/a	
Height	52.75	57.75	68.25	68.25	78.25	81.25	88.25	100.75	113.25	113.25	127.75	127.75	150.25	n/a	n/a	n/a	n/a	n/a	
Width <sup>8</sup>	38.00	48.0	52.0	60.0	68.0	72.0	78.0	80.0	89.0	95.0	101.0	114.0	120.0	n/a	n/a	n/a	n/a	n/a	
Gas Heat <sup>9</sup>	n/a	72.0	78.0	70.0	70.0	70.5	82.0	93.75	83.0	81.0	95.75	95.75	108.5	108.5	98.5	106.5	96.0	96.0	
	n/a	1170	1226	1407	1437	1491	1806	2482	2450	2441	3133	3222	3854	3949	4491	4750	4508	4646	

(1) Nominal airflow is based on 500 fpm through a nominal coil (i.e. 500 x unit size 8 = 4000 cfm).

(2) Airflow @ 625 fpm through the flat filter (maximum filter velocity)

(3) Vertical coil modules are not available in size 57 units. Refer to Table 3 for row limitations in vertical coil modules.

(4) For sizes 3-50 blow-thru applications, electric heat modules require, at a minimum, a large module immediately downstream and a medium module immediately upstream. For size 66 blow-thru applications, electric heat modules require, at a minimum, a medium-large access module downstream and a medium module immediately upstream.

(5) IFB coil modules require a module immediately downstream: (at a minimum) a large module on size 3, medium module on sizes 6 to 40, or an extended-medium module on sizes 50 to 120.

(6) Fan module weights include the heaviest fan with the largest ODP motor available.

(7) The weight of the energy wheel module is with the largest wheel available for each unit size. The weights include all dampers and filter rack, they do not include end devices, control wiring or a starter.

(8) All energy wheel widths will be the same for 100 percent and mixed air units except the size 25 mixed air energy wheel module is 82 inches wide.

(9) Lengths and weights of the gas heat modules are with the largest capacity burner. Refer to the M-Series Gas Heat Quick Select (CLCH-SLB004-EN) or the TOPSS selection program for detailed dimensions.



## M-Series Air Handler Quick Select

**Table 2. Size the Air-Handling Unit**

Coil Type	Unit Size	3	6	8	10	12	14
1/2-inch Unit	Area (ft <sup>2</sup> )	3.32	5.86	7.54	9.64	12.30	14.22
	Qty-Size	1-21.25 x 22.50	1-23.75 x 35.50	1-27.50 x 39.50	1-27.50 x 50.50	1-32.50 x 54.50	1-35.00 x 58.50
5/8-inch Unit <sup>1</sup>	Area (ft <sup>2</sup> )	2.98	5.47	7.31	9.38	12.38	13.90
	Qty-Size	1-19.50 x 22.00	1-22.50 x 35.00	1-27.00 x 39.00	1-27.00 x 50.00	1-33.00 x 54.00	1-34.50 x 58.00
5/8-inch Modified	Area (ft <sup>2</sup> )	1.83	2.92	4.88	6.25	9.00	9.67
	Qty-Size	1-12.00 x 22.00	1-12.00 x 35.00	1-18.00 x 39.00	1-18.00 x 50.00	1-24.00 x 54.00	1-24.00 x 58.00
Coil Type	Unit Size	17	21	25	30	35	40
1/2-inch Unit	Area (ft <sup>2</sup> )	16.80	20.78	24.38	29.01	34.14	39.33
	Qty-Size	1-37.50 x 64.50	1-45.00 x 66.50	1-51.25 x 68.50	1-51.25 x 81.50	1-57.50 x 85.50	1-57.50 x 98.50
5/8-inch Unit <sup>1</sup>	Area (ft <sup>2</sup> )	16.67	19.94	23.38	27.70	32.76	37.77
	Qty-Size	1-37.50 x 64.00	1-43.50 x 66.00	1-49.50 x 68.00	1-49.25 x 81.00	1-55.50 x 85.00	1-55.50 x 98.00
5/8-inch Modified	Area (ft <sup>2</sup> )	13.33	30.25	17.00	20.25	21.25	24.50
	Qty-Size	1-30.00 x 64.00	2-33.00 x 66.00	2-8.00 x 68.00	2-18.00 x 81.00	2-18.00 x 85.00	2-18.00 x 98.00
Coil Type	Unit Size	50	57	66	80	100	120
1/2-inch Unit	Area (ft <sup>2</sup> )	49.43	57.03	65.63	78.75	100.36	119.58
	Qty-Size	2-32.5 x 109.5	2-37.50 x 109.50	2-37.50 x 126.00	2-45.00 x 126.00	2-51.25 x 141.00	2-51.25 x 168.00
5/8-inch Unit <sup>1</sup>	Area (ft <sup>2</sup> )	47.69	56.77	65.63	78.75	99.88	119.00
	Qty-Size	1-30.00 x 109.00 1-33.00 x 109.00	2-37.50 x 109.00	2-37.50 x 126.00	2-45.00 x 126.00	2-51.00 x 141.00	2-1.00 x 168.00
5/8-inch Modified	Area (ft <sup>2</sup> )	36.33	43.15	49.88	60.38	76.38	91.00
	Qty-Size	2-24.00 x 109.00	1-24.00 x 109.00 1-33.00 x 109.00	1-24.00 x 126.00 1-33.00 x 126.00	2-18.00 x 126.00 1-33.00 x 126.00	2-24.00 x 141.00 1-30.00 x 141.00	2-24.00 x 168.00 1-30.00 x 168.00

(1) The area given is for the largest 5/8inch coil per unit size. Other 5/8-inch unit coil areas are available; refer to product catalog CLCH-PRC003-EN or the TOPSS program.

**Table 3. Size the Coil Module**

Coil type	Unit size	Rows Available					
		3-6	8-30	35-40	50	57	66-120
1/2-inch	Small	2	2	2	2 and 4	2 and 4	2 and 4
	Medium	2-8	2-8	2-8	n/a	n/a	n/a
	Extended-Medium	2-8	2-8	2-8	2-8	2-8	2-8
	Medium large	n/a	2-8	2-8	2-8	2-8	2-8
	Medium large w/ access	n/a	2-8	2-8	2-8	2-8	2-8
	Large	2-8	2-8	2-8	2-8	2-8	n/a
	Large w/ access	n/a	2-8	2-8	2-8	2-8	n/a
	Large vertical	2-8	2-8	2-8	2-8	n/a	n/a
Multizone (cold deck)	2-8	2-8	2-8	2-8	n/a	n/a	
5/8-inch	Small	1 and 2	1 and 2	1 and 2	1-4	1-4	1-4
	Medium	1-4	1-4	1-4	n/a	n/a	n/a
	Extended-Medium	1-6	1-6	1-6	1-6	1-6	1-6
	Medium large	n/a	1-10	1-10	1-10	1-10	1-10
	Medium large w/ access	n/a	1-4	1-6	1-6	1-6	1-6
	Large	1-10	1-10	1-10	1-10	1-10	n/a
	Large w/ access	n/a	1-8 <sup>1</sup>	1-10	1-10	1-10	n/a
	Large vertical	1-6	1-6	1-6	1-6	n/a	n/a
Multizone (cold deck)	1-4	1-4	1-4	1-6	n/a	n/a	

(1) On unit size 21, there is a 6-row maximum for stacked coils.



## M-Series Air Handler Quick Select

**Table 4. Select the Filter Type**

Filter Type	Unit Size	3	6	8	10	12	14	17	21	25
Flat (2-in., 4-in.) T.A., permanent, pleated media, combination	Area (ft <sup>2</sup> )	3.47	5.56	6.94	9.72	13.33	14.44	17.50	20.00	24.00
	Qty-Size	1-25 × 20	2-20 × 20	2-20 × 25	2-20 × 25 1-16 × 25	6-20 × 16	4-20 × 16 2-25 × 16	1-20 × 16 1-20 × 20 2-25 × 16 2-25 × 20	4-20 × 20 4-16 × 20	6-24 × 24
Angled (2-in. or 4-in.) T.A., permanent, pleated media	Area (ft <sup>2</sup> )	5.56	8.89	11.11	13.89	16.67	26.67	28.89	31.11	38.89
	Qty-Size	2-25 × 16	4-20 × 16	4-20 × 20	4-25 × 20	6-20 × 20	12-20 × 16	8-20 × 16 4-25 × 16	4-20 × 16 8-25 × 16	4-20 × 20 8-25 × 20
Bag/cartridge, 2-in. prefilters	Area (ft <sup>2</sup> )	3.33	5.56	6.67	9.33	10.00	12.89	15.33	20.00	24.00
	Qty-Size	1-24 × 20	2-20 × 20	2-20 × 24	3-12 × 24 1-20 × 24	3-20 × 24	2-20 × 20 1-24 × 20 2-24 × 12	2-24 × 24 2-24 × 12 1-20 × 24	6-24 × 20	6-24 × 20
HEPA	Area (ft <sup>2</sup> )	4.00	6.00	8.00	10.00	12.00	14.00	18.00	22.00	24.00
	Qty-Size	1-24 × 24	1-12 × 24 1-24 × 24	2-24 × 24	1-12 × 24 2-24 × 24	2-24 × 12 2-24 × 24	2-24 × 12 1-12 × 24 2-24 × 24	3-24 × 12 3-24 × 24	2-12 × 24 2-24 × 24	6-24 × 24
Filter Type	Unit Size	30	35	40	50	57	66	80	100	120
Flat (2-in., 4-in.) T.A., permanent, pleated media, combination	Area (ft <sup>2</sup> )	28	31.94	36.11	48.33	57.50	65.00	80.67	102.78	122.22
	Qty-Size	6-20 × 24 2-24 × 24	6-20 × 25 4-16 × 25	4-20 × 25 8-16 × 25	3-16 × 20 12-25 × 20	4-20 × 16 4-20 × 20 6-25 × 16 6-25 × 20	8-20 × 16 8-20 × 20 4-25 × 16 4-25 × 20	6-20 × 20 6-20 × 24 6-24 × 20 6-24 × 24	12-16 × 25 20-20 × 25	4-16 × 25 32-20 × 25
Angled (2-in. or 4-in.) T.A., permanent, pleated media	Area (ft <sup>2</sup> )	47.22	61.33	69.33	80.56	96.67	108.33	132.00	161.11	194.44
	Qty-Size	12-20 × 20 4-25 × 20	4-20 × 24 12-24 × 24	16-20 × 24 4-24 × 24	20-20 × 25 4-16 × 25	30-20 × 20 6-16 × 20	12-25 × 20 24-20 × 20	6-12 × 24 30-24 × 24	40-25 × 20 8-20 × 20	56-25 × 20
Bag/cartridge, 2-in. prefilters	Area (ft <sup>2</sup> )	28.00	30.67	36.89	51.56	54.67	64.00	80.67	106.22	125.78
	Qty-Size	6-24 × 24 2-12 × 24	6-24 × 24 2-20 × 24	4-24 × 12 8-20 × 20 2-24 × 20	4-24 × 24 8-24 × 20 2-20 × 20 1-20 × 24	8-24 × 12 2-20 × 24 8-24 × 24	6-20 × 24 10-24 × 12 6-24 × 24	6-20 × 24 6-24 × 24 6-24 × 20	20-20 × 20 12-24 × 12 8-24 × 20	16-20 × 20 14-24 × 12 16-24 × 20
HEPA	Area (ft <sup>2</sup> )	28.00	34.00	40.00	51.00	54.00	70.00	80.00	102.00	119.00
	Qty-Size	2-12 × 24 6-24 × 24	3-24 × 12 2-12 × 24 6-24 × 24	4-24 × 12 8-24 × 24	9-24 × 24 3-30 × 24	3-12 × 24 12-24 × 24	5-24 × 12 15-24 × 24	20-24 × 24	18-24 × 24 6-24 × 30	21-24 × 24 7-24 × 30



## M-Series Air Handler Quick Select

**Table 5. Select a Fan**

Nominal Airflow <sup>1</sup>	1500	3000	4000	5000	6000	7000	8500	10500	12500	
Airflow @ 625 fpm <sup>2</sup>	2169	3475	4338	6075	8331	9025	10938	12500	15000	
Unit Size	3	6	8	10	12	14	17	21	25	
Fan Identification										
A	Fan size / type	9.5 FC	12.25 FC	13.5 FC	15 FC	16.5 FC	18.25 FC	20 FC	22.38 FC	25 FC
	Max TSP/rpm	2.5/1800	2.5/1403	2.5/1273	2.5/1146	2.5/1042	2.5/942	2.5/859	3-972	3/811
	Motor hp range (ODP)	0.25-2	0.25-5	0.5-5	1-5	1-7.5	1-7.5	1-10	1-10	1-10
	Outlet area (ft <sup>2</sup> )	0.85	1.90	2.31	2.79	3.39	4.14	5.05	5.16	6.82
B	Fan size / type	9.5 FC	10.5 FC	12.25 FC	13.5 FC	15 FC	16.5 FC	18.25 FC	20 FC	22.38 FC
	Max TSP/rpm	5/2800	5/2365	5-2027	5/1839	5/1,655	5/1505	5/1,360	5-1241	5/1273
	Motor hp range (ODP)	1-5	1-5	1-7.5	1-7.5	1-10	1-10	1-10	1-15	1-20
	Outlet area (ft <sup>2</sup> )	0.65	1.41	1.90	2.31	2.79	3.39	4.14	5.05	5.16
D	Fan size / type	9 BC	12 AF	12 AF	15 AF	18 AF	18 AF	20 AF	22 AF	22 AF
	Max TSP/rpm	6/4100	6/3700	6/3700	6/2900	6/2450	6/2450	6/2200	6/1850	6/1850
	Motor hp range (ODP)	1-3	1-7.5	1-7.5	1-10	1-10	1-10	1-15	1-15	1-15
	Outlet area (ft <sup>2</sup> )	0.84	1.45	1.45	2.04	2.86	2.86	4.38	5.50	5.50
E	Fan size / type	9 BC	12 AF	12 AF	15 AF	18 AF	18 AF	20 AF	22 AF	22 AF
	Max TSP / rpm	8/4800	8/3900	8/4200	8/3400	8/2800	8/2800	8/2450	8/2300	8/2300
	Motor hp range (ODP)	1-5	1-7.5	1-10	1-15	1-15	1-15	1-20	1-25	1-25
	Outlet area (ft <sup>2</sup> )	0.84	1.45	1.45	2.04	2.86	2.86	4.38	5.50	5.50
F	Fan size / type	n/a <sup>3</sup>	n/a	n/a	12 AF	15 AF	15 AF	18 AF	20 AF	20 AF
	Max TSP / rpm	n/a	n/a	n/a	6/3700	6/2900	6/2900	6/2400	6/2200	6/2200
	Motor hp range (ODP)	n/a	n/a	n/a	1-7.5	1-10	1-10	1-10	1-15	1-15
	Outlet area (ft <sup>2</sup> )	n/a	n/a	n/a	1.45	2.04	2.04	2.86	4.38	4.38
G	Fan size / type	n/a	n/a	n/a	12 AF	15 AF	15 AF	18 AF	20 AF	20 AF
	Max TSP / rpm	n/a	n/a	n/a	8/4200	8/3400	8/3400	8/2600	8/2450	8/2450
	Motor hp range (ODP)	n/a	n/a	n/a	1-10	1-15	1-15	1-20	1-25	1-25
	Outlet area (ft <sup>2</sup> )	n/a	n/a	n/a	1.45	2.04	2.04	2.86	4.38	4.38
P	Fan size / type	13.22 AF	14.56 AF	16.19 AF	17.81 AF	19.69 AF	21.56 AF	24.00 AF	29.13 AF	32.38 AF
	Max TSP / rpm	6/4150	6/4017	6/3595	6/3525	6/3165	6/2950	6/2425	6/1886	6/1611
	Motor hp range (ODP)	1-3	1-7.5	1-7.5	1-10	1-15	1-15	1-15	2-15	3-20
	Outlet area (ft <sup>2</sup> )	n/a	n/a	n/a	n/a	19 Q	19 Q	21.5 Q	24.5 Q	27 Q
Q	Fan size / type	n/a	n/a	n/a	n/a	19 Q	19 Q	21.5 Q	24.5 Q	27 Q
	Max TSP / rpm	n/a	n/a	n/a	n/a	6/3145	6/3145	6/2780	6/2380	6/2160
	Motor hp range (ODP)	n/a	n/a	n/a	n/a	0.5-7.5	0.5-7.5	0.5-10	0.5-15	0.5-15
	Outlet area (ft <sup>2</sup> )	n/a	n/a	n/a	n/a	2.30	2.30	2.88	3.73	4.54
R	Fan size / type	n/a	n/a	n/a	n/a	21.5 Q	21.5 Q	24.5 Q	27 Q	30 Q
	Max TSP / rpm	n/a	n/a	n/a	n/a	6/2780	6/2780	6/2380	6/2160	6/1940
	Motor hp range (ODP)	n/a	n/a	n/a	n/a	0.5-10	0.5-10	0.5-15	0.5-15	0.5-20
	Outlet area (ft <sup>2</sup> )	n/a	n/a	n/a	n/a	2.88	2.88	3.73	4.54	5.66
V	Fan size / type	n/a	16.5 Q	16.5 Q	16.5 Q	19 Q	19 Q	21.5 Q	24.5 Q	27 Q
	Max TSP / rpm	n/a	6/3460	6/3460	6/3460	6/3145	6/3145	6/2780	6/2380	6/2160
	Motor hp range (ODP)	n/a	0.5-5	0.5-5	0.5-5	0.5-7.5	0.5-7.5	0.5-10	0.5-15	0.5-15
	Outlet area (ft <sup>2</sup> )	n/a	1.40	1.40	1.40	2.30	2.30	2.88	3.73	4.54
W	Fan size / type	n/a	19 Q	19 Q	19 Q	21.5 Q	21.5 Q	24.5 Q	27 Q	30 Q
	Max TSP / rpm	n/a	6/3145	6/3145	6/3145	6/2780	6/2780	6/2380	6/2160	6/1940
	Motor hp range (ODP)	n/a	0.5-7.5	0.5-7.5	0.5-7.5	0.5-10	0.5-10	0.5-15	0.5-15	0.5-20
	Outlet area (ft <sup>2</sup> )	n/a	2.30	2.30	2.30	2.88	2.88	3.73	4.54	5.66

(1) Nominal airflow is based on 500 fpm through a nominal coil (i.e. 500 x unit size 8 = 4000 cfm).

(2) Airflow @ 625 fpm through the flat filter (maximum filter velocity)

(3) "n/a" selections are not available as standard, however, contact your local Trane sales representative for possible specials.



## M-Series Air Handler Quick Select

**Table 5. (continued) Select a Fan**

Nominal Airflow <sup>1</sup>	15000	17500	20000	25000	28500	33000	40000	50000	60000
Airflow @ 625 fpm <sup>2</sup>	17500	19963	22569	30206	35938	40625	50419	64238	76388
Fan ID/Unit Size	30	35	40	50	57	66	80	100	120
A Fan size/type	25 FC	27.63 FC	30.25 FC	33 FC	33 FC	33 FC	36 FC	40 FC	40 FC
Max TSP/rpm	3/811	3/698	3-664	3/580	3/580	6/760	3/600	3/550	3/550
Motor hp range (ODP)	1-20	5-25	5-25	5-30	5-30	10-60	15-40	15-40	15-40
Outlet area (ft <sup>2</sup> )	6.73	8.08	9.79	11.69	11.69	11.69	13.62	17.14	17.14
B Fan size/type	22.38 FC	25 FC	27.63 FC	30.25 FC	30.25 FC	36 FC	36 FC	40 FC	40 FC
Max TSP/rpm	5/1273	5/1062	5/905	5/870	5/870	5/665	5/665	5/600	5/600
Motor hp range (ODP)	1-25	5-30	5-30	5-40	5-40	15-75	20-75	25-75	25-75
Outlet area (ft <sup>2</sup> )	5.16	6.73	8.08	9.79	9.79	13.62	13.62	17.14	17.14
D Fan size / type	25 AF	25 AF	28 AF	32 AF	32 AF	36 AF	40 AF	44 AF	49 AF
Max TSP / rpm	6/1650	6/1650	6/1500	6/1300	6/1300	6/1250	6/1150	6/850	6/800
Motor hp range (ODP)	2-20	7.5-20	7.5-20	7.5-30	7.5-30	10-30	15-60	15-40	30-75
Outlet area (ft <sup>2</sup> )	6.84	6.84	8.61	10.86	10.86	13.65	17.27	17.12	21.40
E Fan size / type	25 AF	25 AF	28 AF	32 AF	32 AF	36 AF	40 AF	44 AF	49 AF
Max TSP / rpm	8/2100	8/2200	8/2050	8/1700	8/1700	8/1550	8/1350	8/1150	8/1025
Motor hp range (ODP)	2-40	7.5-40	7.5-50	7.5-60	7.5-60	15-75	15-75	15-100	30-125
Outlet area (ft <sup>2</sup> )	6.84	6.84	8.61	10.86	10.86	13.65	17.27	17.12	21.40
F Fan size/type	22 AF	22 AF	25 AF	28 AF	28 AF	32 AF	36 AF	40 AF	44 AF
Max TSP/rpm	6/1,850	6/1900	6/1650	6/1500	6/1500	6/1300	6/1,100	6/1,150	6/850
Motor hp range (ODP)	2-15	7.5-15	7.5-20	7.5-25	7.5-25	10-30	15-30	15-60	30-40
Outlet area (ft <sup>2</sup> )	5.43	5.43	6.48	8.61	8.61	10.86	13.59	17.27	17.13
G Fan size/type	22 AF	22 AF	25 AF	28 AF	28 AF	32 AF	36 AF	40 AF	44 AF
Max TSP/rpm	8/2300	8/2500	8/2200	8/2050	8/2050	8/1700	8/1450	8/1350	8/1150
Motor hp range (ODP)	2-30	7.5-40	7.5-50	7.5-60	7.5-60	10-60	15-75	15-100	30-125
Outlet area (ft <sup>2</sup> )	5.43	5.43	6.48	8.61	8.61	10.86	13.59	17.27	17.13
P Fan size/type	35.56 AF	35.56 AF	39.38 AF	43.44 AF	43.44 AF	52.88 AF	58.5 AF	64.75 AF	64.75 AF
Max TSP/rpm	6/1643	6/1643	6/1412	6/1334	6/1334	6/885	6/792	6/791	6/791
Motor hp range (ODP)	3-25	5-30	5-30	5-40	5-40	7.5-50	7.5-60	10-75	10-75
Q Fan size/type	30 Q	33 Q	33 Q	36.5 Q	40.25 Q	40.25 Q	44.5 Q	n/a	n/a
Max TSP/rpm	6/1,940	6/1822	6/1822	6/1647	6/1492	6/1492	6/1352	n/a	n/a
Motor hp range (ODP)	0.5-20	1-25	1-25	1-30	1.5-40	1.5-40	3-40	n/a	n/a
Outlet area (ft <sup>2</sup> )	5.66	6.84	6.84	8.36	10.16	10.16	12.40	n/a	n/a
R Fan size/type	33 Q	36.5 Q	36.5 Q	40.25 Q	44.5 Q	44.5 Q	n/a	n/a	n/a
Max TSP/rpm	6/1,822	6/1647	6/1647	6/1492	6/1352	6/1352	n/a	n/a	n/a
Motor hp range (ODP)	1-25	1-30	1-30	1.5-40	3-40	3-40	n/a	n/a	n/a
Outlet area (ft <sup>2</sup> )	6.84	8.36	8.36	10.16	12.44	12.40	n/a	n/a	n/a
V Fan size / type	30 Q	33 Q	33 Q	36.5 Q	40.25 Q	40.25 Q	44.5 Q	n/a	n/a
Max TSP / rpm	6/1940	6/1822	6/1647	6/1647	6/1492	6/1492	6/1352	n/a	n/a
Motor hp range (ODP)	0.5-20	1-25	1-25	1-30	1.5-40	1.5-40	3-40	n/a	n/a
Outlet area (ft <sup>2</sup> )	5.66	6.84	6.84	8.36	10.16	10.16	12.40	n/a	n/a
W Fan size / type	33 Q	36.5 Q	36.5 Q	40.25 Q	44.5 Q	44.5 Q	n/a	n/a	n/a
Max TSP / rpm	6/1822	6/1647	6/1647	6/1492	6/1352	6/1352	n/a	n/a	n/a
Motor hp range (ODP)	1-25	1-30	1-30	1.5-40	3-40	3-40	n/a	n/a	n/a
Outlet area (ft <sup>2</sup> )	6.84	8.36	8.36	10.16	12.44	12.40	n/a	n/a	n/a

(1) Nominal airflow is based on 500 fpm through a nominal coil (i.e. 500 x unit size 8 = 4000 cfm).

(2) Airflow @ 625 fpm through the flat filter (maximum filter velocity)

(3) "n/a" selections are not available as standard, however, contact your local Trane sales representative for possible specials.



Joseph Lookup  
Senior Thesis 2005  
Wegmans Fairfax

---

# Appendix-4

## Structural Appendix



# VULCRAFT LH & DLH SERIES / GENERAL INFORMATION

## HIGH STRENGTH

## ECONOMICAL

**DESIGN** – Vulcraft LH & DLH Series long span steel joists are designed in accordance with the specifications of the Steel Joist Institute.

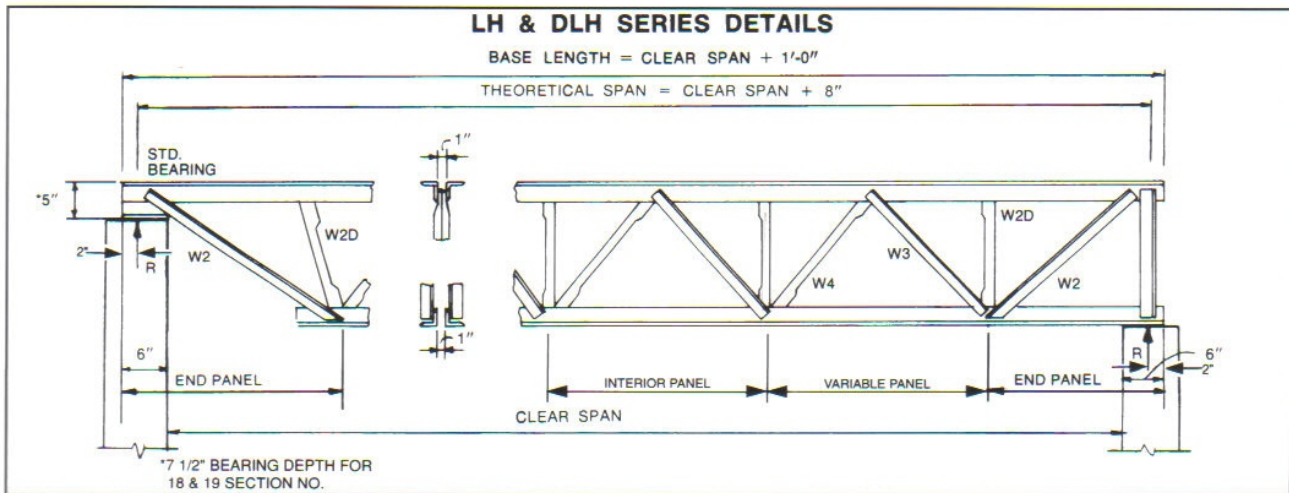
**ACCESSORIES** see page 40.

## ROOF SPANS TO 144'-0"

## FLOOR SPANS TO 120'-0"

**PAINT** – Vulcraft joists receive a shop-coat of rust inhibitive primer whose performance characteristics conform to those of the Steel Joist Institute specification 102.4.

**SPECIFICATIONS** see page 54.



MAXIMUM JOIST SPACING FOR DIAGONAL BRIDGING					
JOIST DEPTH	BRIDGING ANGLE SIZE-EQUAL LEG ANGLES				
	1x7/64 (25mm x 3mm) r = .20"	1-1/4x7/64 (32mm x 3mm) r = .25"	1-1/2x7/64 (38mm x 3mm) r = .30"	1-3/4x7/64 (45mm x 3mm) r = .35"	2x1/8 (51mm x 3mm) r = .40"
32	6'-1" (1854mm)	7'-10" (2387mm)	9'-7" (2921mm)	11'-4" (3454mm)	13'-0" (3962mm)
36		7'-9" (2362mm)	9'-6" (2895 mm)	11'-3" (3429mm)	12'-11" (3973mm)
40		7'-7" (2311mm)	9'-5" (2870 mm)	11'-2" (3403mm)	12'-10" (3911mm)
44		7'-5" (2260mm)	9'-3" (2819 mm)	11'-0" (3352mm)	12'-9" (3886mm)
48		7'-3" (2209mm)	9'-2" (2794 mm)	10'-11" (3327mm)	12'-8" (3860mm)
52			9'-0" (2743 mm)	10'-9" (3276mm)	12'-7" (3835mm)
56			8'-10" (2692 mm)	10'-8" (3251mm)	12'-5" (3784mm)
60			8'-7" (2616 mm)	10'-6" (3200mm)	12'-4" (3759mm)
64			8'-5" (2565 mm)	10'-4" (3149mm)	12'-2" (3708mm)
68			8'-2" (2489 mm)	10'-2" (3098mm)	12'-0" (3657mm)
72			8'-0" (2438 mm)	10'-0" (3048mm)	11'-10" (3606mm)

LH & DLH TABLE MINIMUM BEARING LENGTHS			
Joist Type	On Masonry	On Concrete	On Steel
LH 02 thru 17 DLH 10 thru 19	6"	6"	4"
MINIMUM BEARING PLATE WIDTHS			
LH 02 thru LH 12 DLH 10 thru DLH 12	9"	9"	
LH 13 thru LH 17 DLH 13 thru DLH 19	12"	12"	

SECTION NUMBER*	MAX. SPACING OF LINES OF BRIDGING	HORIZONTAL BRACING FORCE	
		lbs.	(N)
02, 03, 04	11'-0" (3352mm)	400	(1779)
05 - 06	12'-0" (3657mm)	500	(2224)
07 - 08	13'-0" (3962mm)	650	(2891)
09 - 10	14'-0" (4267mm)	800	(3558)
11 - 12	16'-0" (4876mm)	1000	(4448)
13 - 14	16'-0" (4876mm)	1200	(5337)
15 - 16	21'-0" (6400mm)	1600	(7117)
17	21'-0" (6400mm)	1800	(8006)
18 - 19	26'-0" (7924mm)	2000	(8896)

NUMBER OF LINES OF BRIDGING BASED ON CLEAR SPAN.  
\*LAST TWO DIGITS OF JOIST DESIGNATION.

MAXIMUM JOIST SPACING FOR HORIZONTAL BRIDGING						
SECTION NUMBER*	BRIDGING ANGLE SIZE-EQUAL LEG ANGLES					
	1x7/64 (25mm x 3mm) r = .20"	1-1/4x7/64 (32mm x 3mm) r = .25"	1-1/2x7/64 (38mm x 3mm) r = .30"	1-3/4x7/64 (45mm x 3mm) r = .35"	2x1/8 (51mm x 3mm) r = .40"	2-1/2x5/32 (64mm x 4mm) r = .50"
02, 03, 04	4'-7" (1397mm)	6'-3" (1905mm)	7'-6" (2286mm)	8'-9" (2667mm)	10'-0" (3048mm)	12'-4" (3759mm)
05 - 06	4'-1" (1245mm)	5'-9" (1753mm)	7'-6" (2286mm)	8'-9" (2667mm)	10'-0" (3048mm)	12'-4" (3759mm)
07 - 08	3'-9" (1143mm)	5'-1" (1549mm)	6'-8" (2032mm)	8'-6" (2590mm)	10'-0" (3048mm)	12'-4" (3759mm)
09 - 10		4'-6" (1372mm)	6'-0" (1829mm)	7'-8" (2337mm)	10'-0" (3048mm)	12'-4" (3759mm)
11 - 12		4'-1" (1245mm)	5'-5" (1651mm)	6'-10" (2083mm)	8'-11" (2718mm)	12'-4" (3759mm)
13 - 14		3'-9" (1143mm)	4'-11" (1499mm)	6'-3" (1905mm)	8'-2" (2489mm)	12'-4" (3759mm)
15 - 16			4'-3" (1295mm)	5'-5" (1651mm)	7'-1" (2159mm)	11'-0" (3353mm)
17			4'-0" (1219mm)	5'-1" (1549mm)	6'-8" (2032mm)	10'-5" (3175mm)

\*REFER TO THE LAST DIGITS OF JOIST DESIGNATION CONNECTION TO JOIST MUST RESIST FORCES LISTED IN TABLE 104.5.1.

MIN. A307 BOLT REQ'D FOR CONNECTION		
SERIES	SECTION NUMBER*	A307 BOLT DIAMETER
LH/DLH	2 - 12	3/8" (9mm)
LH/DLH	13 - 17	1/2" (12mm)
DLH	18 & 19	5/8" (15mm)

\*LAST TWO DIGITS OF JOIST DESIGNATION.

- NOTES: 1. Special designed LH and DLH can be supplied in longer lengths. See SLH Series Page 63.
2. Additional bridging may be required when joists support standing seam roof decks. The specifying professional should require that the joist manufacturer check the system and provide bridging as required to adequately brace the joists against lateral movement. For bridging requirements due to uplift pressures refer to sect. 104.12.



**STANDARD LOAD TABLE/LONG SPAN STEEL JOISTS, LH-SERIES**  
Based on a Maximum Allowable Tensile Stress of 30 ksi

Joist Designation	Approx. Wt in Lbs. Per Linear Ft. (Joists only)	Depth in inches	SAFELOAD* in Lbs. Between	CLEARSPANINFEET																		
				28-32																		
				33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48			
24LH03	11	24	11500	342	339	336	323	307	293	279	267	255	244	234	224	215	207	199	191			
24LH04	12	24	14100	419	398	379	360	343	327	312	298	285	273	262	251	241	231	222	214			
24LH05	13	24	15100	449	446	440	419	399	380	363	347	331	317	304	291	280	269	258	248			
24LH06	16	24	20300	604	579	555	530	504	480	457	437	417	399	381	364	348	334	320	307			
24LH07	17	24	22300	665	638	613	588	565	541	516	491	468	446	426	407	389	373	357	343			
24LH08	18	24	23800	707	677	649	622	597	572	545	520	497	475	455	435	417	400	384	369			
24LH09	21	24	28000	832	808	785	764	731	696	663	632	602	574	548	524	501	480	460	441			
24LH10	23	24	29600	882	856	832	809	788	768	737	702	668	637	608	582	556	533	511	490			
24LH11	25	24	31200	927	900	875	851	829	807	787	768	734	701	671	642	616	590	567	544			
				624	588	555	525	498	472	449	418	388	361	337	315	294	276	259	243			
				<b>33-39</b>	<b>40</b>	<b>41</b>	<b>42</b>	<b>43</b>	<b>44</b>	<b>45</b>	<b>46</b>	<b>47</b>	<b>48</b>	<b>49</b>	<b>50</b>	<b>51</b>	<b>52</b>	<b>53</b>	<b>54</b>	<b>55</b>	<b>56</b>	
28LH05	13	28	14000	14000	337	323	310	297	286	275	265	255	245	237	228	220	213	206	199	193		
28LH06	16	28	18600	18600	448	429	412	395	379	364	350	337	324	313	301	291	281	271	262	253		
28LH07	17	28	21000	21000	505	484	464	445	427	410	394	379	365	352	339	327	316	305	295	285		
28LH08	18	28	22500	22500	540	517	496	475	456	438	420	403	387	371	357	344	331	319	308	297		
28LH09	21	28	27700	27700	667	639	612	586	563	540	519	499	481	463	446	430	415	401	387	374		
28LH10	23	28	30300	30300	729	704	679	651	625	600	576	554	533	513	495	477	460	444	429	415		
28LH11	25	28	32500	32500	780	762	736	711	682	655	629	605	582	561	540	521	502	485	468	453		
28LH12	27	28	35700	35700	857	837	818	800	782	766	737	709	682	656	632	609	587	566	546	527		
28LH13	30	28	37200	37200	895	874	854	835	816	799	782	766	751	722	694	668	643	620	598	577		
					569	543	518	495	472	452	433	415	396	373	352	332	314	297	281	266		
					<b>38-46</b>	<b>47-48</b>	<b>49</b>	<b>50</b>	<b>51</b>	<b>52</b>	<b>53</b>	<b>54</b>	<b>55</b>	<b>56</b>	<b>57</b>	<b>58</b>	<b>59</b>	<b>60</b>	<b>61</b>	<b>62</b>	<b>63</b>	<b>64</b>
32LH06	14	32	16700	16700	338	326	315	304	294	284	275	266	257	249	242	234	227	220	214	208		
32LH07	16	32	18800	18800	411	397	383	369	357	345	333	322	312	302	293	284	275	267	259	252		
32LH08	17	32	20400	20400	441	429	412	395	379	364	350	337	324	313	301	291	281	271	262	253		
32LH09	21	32	25600	25600	516	498	480	463	447	432	418	404	391	379	367	356	345	335	325	315		
32LH10	21	32	28300	28300	571	550	531	512	495	478	462	445	430	416	402	389	376	364	353	342		
32LH11	24	32	31000	31000	625	602	580	560	541	522	505	488	473	458	443	429	416	403	390	378		
32LH12	27	32	36400	36400	734	712	688	664	641	619	598	578	559	541	524	508	492	477	463	449		
32LH13	30	32	40600	40600	817	801	785	771	742	715	690	666	643	621	600	581	562	544	527	511		
32LH14	33	32	41800	41800	843	826	810	795	780	766	738	713	688	665	643	622	602	583	564	547		
32LH15	35	32	43200	43200	870	853	837	821	805	791	776	763	750	725	701	678	656	635	616	597		
					532	511	492	473	454	438	422	407	393	374	355	338	322	306	292	279		
					<b>42-46</b>	<b>47-56</b>	<b>57</b>	<b>58</b>	<b>59</b>	<b>60</b>	<b>61</b>	<b>62</b>	<b>63</b>	<b>64</b>	<b>65</b>	<b>66</b>	<b>67</b>	<b>68</b>	<b>69</b>	<b>70</b>	<b>71</b>	<b>72</b>
36LH07	16	36	16800	16800	292	283	274	266	258	251	244	237	230	224	218	212	207	201	196	191		
36LH08	18	36	18500	18500	321	311	302	293	284	276	268	260	252	246	239	233	227	221	215	209		
36LH09	21	36	23700	23700	411	398	386	374	363	352	342	333	323	314	306	297	289	282	275	267		
36LH10	21	36	26100	26100	454	440	426	413	401	389	378	367	357	347	338	328	320	311	303	295		
36LH11	23	36	28500	28500	495	480	465	451	438	425	412	401	389	378	368	358	348	339	330	322		
36LH12	25	36	34100	34100	593	575	557	540	523	508	493	478	464	450	437	424	412	400	389	378		
36LH13	30	36	40100	40100	697	675	654	634	615	596	579	562	546	531	516	502	488	475	463	451		
36LH14	36	36	44200	44200	768	755	729	706	683	661	641	621	602	584	567	551	535	520	505	492		
36LH15	36	36	46600	46600	809	795	781	769	744	721	698	677	656	637	618	600	583	567	551	536		
					480	464	448	434	413	394	375	358	342	327	312	299	286	274	263	252		





**WHAT ARE JOIST GIRDERS?**

Joist girders are primary framing members. The design is simple span, supporting equally spaced concentrated loads from open web steel joists. These concentrated loads are considered to act at the panel points of the joist girder.

Joist girders are designed to allow for the efficient use of steel in longer spans for primary framing members.

The following weight tables list joist girders from 20" to 96" deep and spans up to 100 feet. (For depths and lengths not listed contact Vulcraft.) The depth designation is determined by the nominal depth at the center of the span, except for offset double pitched girders, where the depth is determined at the ridge.

The standard configuration of a joist girder is parallel chord with underslung ends and bottom chord extensions. (Joist girders can be furnished in other configurations, see below.) The standard depth of bearing for joist girders is 7 1/2 inches at the end of the bearing seat.\*

The standard method of connecting girders to columns is two 3/4" diameter A325 bolts. A loose connection of the lower chord to the column or other support is required during erection in order to stabilize the lower chord laterally and to help brace the joist girder against overturning. **CAUTION: IF A RIGID CONNECTION OF THE BOTTOM CHORD IS TO BE MADE TO COLUMN OR OTHER SUPPORT, IT IS TO BE MADE ONLY**

**AFTER THE APPLICATION OF THE DEAD LOADS. THE JOIST GIRDER IS THEN NO LONGER SIMPLY SUPPORTED AND THE SYSTEM MUST BE INVESTIGATED FOR CONTINUOUS FRAME ACTION BY THE SPECIFYING PROFESSIONAL.**

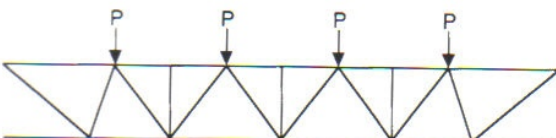
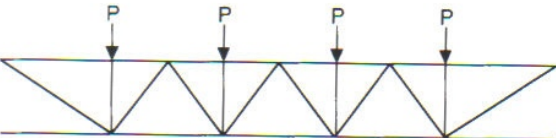
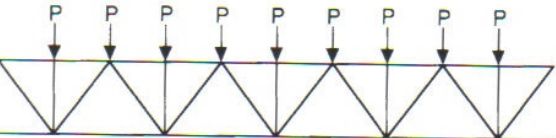
Joist girders along the perimeter, with joists coming in from one side only, and those with unbalanced loads must be designed such that the reactions pass through the center of the joist girder.

The weight tables list the approximate weight per linear foot for a joist girder supporting the panel point loads given by the specifying engineer. **NOTE: THE WEIGHT OF THE JOIST GIRDER MUST BE INCLUDED IN THE PANEL POINT LOAD. (SEE THE EXAMPLE ON PAGE 80).**

For calculating the approximate deflection or checking ponding the following formula may be used in determining the approximate moment of inertia of the joist girder.  $I_{JG} = 0.027 NPLd$

Where N = number of joist spaces, P = panel point load in kips, L = joist girder length in feet and d = effective depth of the joist girder in inches. Contact Vulcraft if a more exact joist girder moment of inertia must be known.

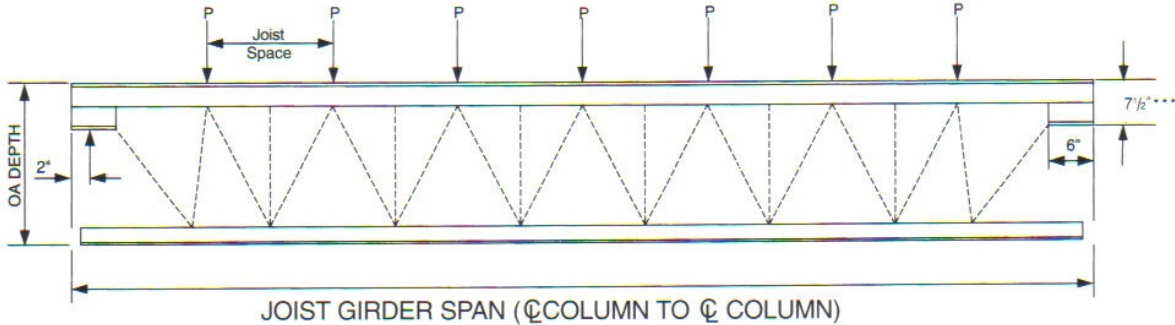
\*Increase seat depth to 10" if weight of joist girder appears to the right of the stepped blue lines in the weight tables.

	<p><b>G TYPE</b></p>	<p><b>OTHER CONFIGURATIONS AVAILABLE ARE:</b></p> <ul style="list-style-type: none"> <li>DOUBLE PITCH TC, UNDERSLUNG</li> <li>SINGLE PITCH TC, UNDERSLUNG</li> <li>OFFSET DOUBLE PITCH TC, UNDERSLUNG</li> </ul>
	<p><b>VG TYPE</b></p>	<p>SEE PAGE 80 FOR DESIGN EXAMPLE</p>
	<p><b>BG TYPE</b></p>	<p><b>NOTE: JOIST GIRDER WEB CONFIGURATION MAY VARY FROM THAT SHOWN. IF EXACT CONFIGURATION IS REQUIRED CONTACT VULCRAFT.</b></p>



# HOW TO SPECIFY VULCRAFT JOIST GIRDERS

For a given joist girder span, the specifying professional first determines the number of joist spaces, Then the panel point loads are calculated and a depth is selected. The following tables gives the Joist Girder weight per linear foot for various depths and loads.



## STANDARD DESIGNATION

<b>48G**</b>	<b>8N</b>	<b>8.8K</b>
Depth in Inches	Number of Joist Spaces	Kip Load on Each Panel Point (One Kip = 1000 lbs.)

Example: Given : 50'-0 x 40'-0 bay      Joists spaced on 6'-3 centers  
 Live Load = 20 psf  
 Dead Load = 15 psf \*  
 Total Load = 35 psf

Note: Web configuration may vary from that shown. Contact Vulcraft if exact layout must be known.

\* Includes the approximate Joist Girder weight in panel point loads.  
 \*\* See page 75 for other Girder Types.  
 \*\*\* Increase to 10" if to the right of the stepped blue lines in the weight tables.

1. Determine number of actual joist spaces (N).  
 In this example, N = 8

2. Joist Selection

- a) Span = 40'-0
- b) T.L. = 6.25 x 35 = 219 plf
- c) from K-Series load tables select a 22K7 (T.L. = 231 > 219; L.L. = 185 > 125) 123 x 1.5 = 185 (1/240 limit applies since ceiling is not plastered)

inch of depth for each foot of span is a good compromise of limited depth and economy. Therefore select depth of 48 inches.

- c) the Joist Girder will then be designated 48G8N8.8K
- d) the Joist Girder table shows the weight for a 48G8N9K is 40 pounds per lineal foot
- e) total weight of this Joist Girder system per square foot is:

Joists 9.7 plf/6.25 = 1.55  
 Girder 40 plf/40 = 1.00  
 2.55 psf

3. Joist Girder Selection

- a) compute the concentrated load at top chord panel points P = 219 x 40 = 8,760 lbs. = 8.8 kips (use 9K for depth selection) Live load deflection rarely governs in Joist Girder selection because of their depth.
- b) Select girder depth  
 The 50'-0 span 8 panel Joist Girder table on page 86 indicates that the rule of about one

- 4. For rectangular bays check economy with joists and girders spanning the opposite way  
 Joists (26K10) 13.8 plf/6.67 = 2.07  
 Girder (40G6N12K) 47 plf/50 = .94  
 3.01 psf

NOTES: 1. When it is required to have joists bear only at vertical web members to gain space for duct work, the Joist Girder should be labeled as a "VG" in lieu of a "G".  
 2. The following tables serve as a design guide only. Odd size joist girder lengths, depths, kip loadings, and panel lengths are available.



**DESIGN GUIDE WEIGHT TABLE FOR JOIST GIRDERS**  
**U. S. CUSTOMARY**

Based on an allowable tensile stress of 30ksi

Girder Span (ft)	Joist Spaces (ft)	Girder Depth (in)	Joist Girder Weight - Pounds Per Linear Foot																					
			Load on Each Panel Point																					
			4K	5K	6K	7K	8K	9K	10K	11K	12K	14K	16K	18K	20K	25K	30K	35K	40K	50K	60K	70K	80K	100K
40	3N@ 13.33	32	22	23	23	23	24	24	25	26	27	30	34	38	40	51	60	69	81	94	108	124	150	185
		36	23	23	23	23	23	24	25	25	27	27	32	34	39	46	54	61	70	87	104	111	126	164
		40	23	23	23	23	23	24	25	27	27	28	32	35	43	49	55	62	84	93	107	125	156	
		44	23	23	23	24	24	24	24	26	26	28	28	32	33	42	47	55	63	73	89	99	115	131
	4N@ 10.00	32	16	16	19	22	25	26	28	30	33	39	45	50	53	68	77	90	104	129	152	173	202	252
		36	16	17	18	21	25	25	26	29	31	34	40	44	48	62	71	79	93	115	143	166	179	230
		40	17	17	19	23	25	26	27	29	32	38	41	46	56	68	77	93	109	119	150	172	212	
		44	16	16	18	18	20	21	23	24	28	30	34	37	40	51	57	66	76	104	111	126	150	189
	5N@ 8.00	32	16	18	22	25	28	31	34	37	40	46	54	58	65	78	100	106	130	157	188	227	255	
		36	16	17	20	23	25	27	31	34	35	41	46	54	59	71	91	102	107	143	167	196	230	298
		40	16	16	18	21	23	27	28	30	33	37	42	47	53	64	80	93	104	128	159	182	210	262
		44	17	17	17	20	23	24	28	29	31	35	39	46	49	60	73	81	96	116	138	161	186	245
	6N@ 6.67	32	17	20	24	28	32	35	39	42	47	54	62	69	77	99	108	140	151	189	220	266		
		36	17	20	23	26	28	31	35	38	41	48	55	62	70	83	102	115	142	167	197	232	275	
		40	17	18	21	25	28	29	32	36	38	44	49	56	64	79	94	105	118	147	185	215	245	313
		44	17	18	21	22	27	29	30	33	36	42	49	53	58	74	86	105	111	148	177	199	227	294
	7N@ 5.71	32	19	24	28	32	34	40	45	47	54	62	70	77	91	105	130	152	175	218	255			
		36	18	21	26	28	32	35	40	43	48	56	63	71	79	102	115	143	155	197	232	276		
		40	18	20	25	28	31	33	36	41	45	51	57	65	72	94	108	118	145	184	214	255	300	
		44	18	21	23	27	29	31	34	37	41	50	58	63	67	82	106	113	127	167	199	237	272	
	8N@ 5.00	32	21	27	31	36	39	47	50	58	62	70	83	100	101	121	152	175	197	241				
		36	21	25	29	32	37	40	48	51	56	64	72	84	93	111	144	156	182	222	257			
		40	20	23	27	30	35	38	41	46	51	61	69	76	86	105	119	148	171	203	257	294		
		44	20	24	29	30	34	38	41	45	50	58	66	75	78	98	113	129	153	193	240	278	320	
10N@ 4.00	32	27	33	40	43	51	58	63	70	78	92	103	110	122	168	190	218	246						
	36	27	30	35	41	48	55	62	64	72	79	94	107	116	145	181	199	240	306					
	40	25	28	33	39	43	50	56	57	65	74	86	95	109	134	160	186	212	277					
	44	23	28	31	37	40	48	51	57	59	74	81	88	98	120	150	175	190	255	302				
42	3N@ 14.00	32	29	29	29	30	31	31	32	33	34	35	38	40	45	53	60	69	81	94	118	140	160	185
		36	29	29	30	30	30	31	32	34	33	35	36	38	40	47	57	64	70	87	109	122	141	173
		40	30	30	30	30	30	31	34	34	34	34	35	37	39	46	53	61	71	85	97	112	126	156
		44	30	30	30	30	30	30	32	32	33	35	35	36	37	43	48	56	63	73	89	99	115	146
	4N@ 10.50	32	16	17	20	23	25	28	30	33	35	42	45	50	57	68	89	99	104	140	161	186	214	274
		36	16	16	18	21	23	25	28	30	33	37	44	46	52	66	75	91	101	115	143	175	191	240
		40	17	17	18	21	22	24	26	28	30	34	38	45	47	59	68	79	94	109	134	159	177	214
		44	17	17	18	19	21	25	25	27	29	32	36	42	46	54	65	74	82	106	120	138	164	202
	5N@ 8.40	32	17	20	23	26	28	33	36	39	44	47	54	61	68	90	103	113	130	172	197	225	256	
		36	16	17	21	23	26	28	32	34	37	44	48	54	62	74	91	105	115	152	177	207	233	
		40	16	18	20	22	24	27	29	32	34	40	45	52	55	67	79	93	107	133	156	186	210	266
		44	16	18	19	21	25	26	28	30	32	38	41	47	53	64	77	93	104	119	148	171	200	238
	6N@ 7.00	32	18	21	26	29	33	37	40	45	47	57	65	73	81	99	119	140	160	190	236	289		
		36	17	20	24	27	30	34	36	39	43	51	58	62	70	91	106	121	142	177	209	240	293	
		40	17	19	21	26	28	32	34	36	40	47	55	59	64	79	103	109	123	167	192	222	253	
		44	17	18	21	24	26	29	32	34	36	43	50	57	60	76	95	105	113	148	176	202	227	303
	7N@ 6.00	32	20	24	29	34	37	42	47	53	54	68	77	90	99	113	140	162	187	226	289			
		36	20	23	27	30	35	38	41	46	51	59	70	78	83	102	122	142	166	205	248	292		
		40	18	22	25	28	32	35	39	42	47	56	63	71	79	95	109	134	147	182	222	272	303	
		44	18	21	24	27	30	32	36	40	43	51	57	65	73	87	106	119	137	176	202	246	283	
	8N@ 5.25	32	22	28	33	38	43	47	54	58	65	77	83	100	105	140	163	188	216	268				
		36	20	26	29	34	40	43	49	55	59	67	79	84	101	116	143	167	190	231	290			
		40	20	24	28	33	36	41	45	50	53	61	69	81	86	107	126	151	175	215	264	326		
		44	21	23	28	31	34	37	43	47	52	58	66	79	83	107	116	141	157	201	239	291	333	
11N@ 3.82	32	31	37	45	53	61	69	77	82	91	104	114	130	151	189	218	267							
	36	27	35	41	48	55	62	70	72	79	92	106	115	132	166	197	232	270						
	40	27	32	37	42	49	56	64	65	73	84	103	108	117	149	182	209	243	310					
	44	25	31	35	40	48	51	58	65	66	81	95	106	111	139	167	190	218	281					
48	24	29	34	38	45	50	54	60	67	76	84	98	108	122	154	180	205	259	318					
Bearing Depth		7 1/2 in.																						
		10 in.																						

Joist Girder weights between the heavy black and blue lines have 7 1/2 inch bearing depths.  
Joist Girder weights to the right of the heavy blue line have 10 inch bearing depths. Check with Vulcraft for material availability.