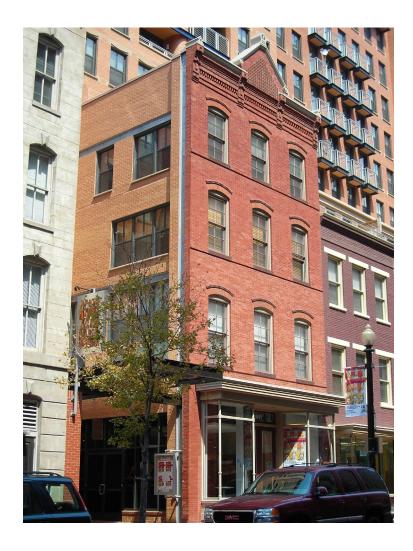
Woolly Mammoth Theatre Washington DC



Kate Feato Lighting/Electrical Option Spring 2007 Lighting Advisor: Dr. Mistrick Electrical Advisor: Professor Dannerth



WOOLLY MAMMOTH THEATRE WASHINGTON DC

KATE FEATO LIGHTING/ELECTRICAL OPTION

Project Team

Owner: Woolly Mammoth Theatre Company Architect: Mcinturff Achitects General Contractor: Davis Construction Structural Engineer: Tadger-Cohm-Edelson MEP Engineer: GHT Chartered Architectural Lighting: C.M. Kling & Assoc. Inc

from 11,250 cfm to 625 cfm. There are 14 fans ranging from 33,000 cfm to 500 cfm. There are six electric heating coils running at 208 volts varying from 8200 cfm to 1200 cfm.

Project Information Location: 641 D Street NW Washington DC Occupancy: 265 seat courtyard style theater with associated support spaces Size: 31,608 SF Number of Stories: 3 Dates of Construction: 4.1.04 - 4.26.05 Project Cost: \$8 Million Delivery Method: Design-Bid-Building



The space has ten air handling units ranging



Electrical

All panelboards are run at 208/120 volt. There are (2) 2000A switchboards. One is servicing all mechanical equipment and motors, while the other is servicing the lighting/dimming and general equipment. There is one transformer used for two fused disconnect switches, which control the audio visual equipment.

Lighting

The lighting has an industrial theme. The fixtures used are simple and edgy. Black, white and aluminum track is used to accentuate walls throughout the lobby. Industrial luminaires and bare par lamps are placed in the theatre and office suite. There is a 22' high light wall, which is lit with bare pars shining down behind semitranslucent laminate panels. 90% of the fixtures in the space are halogen incandescent.



Structural

The building shell was a provided CMU structural cavity with historic brick facade. Floors are metal decking with concrete fill supported by steel joists. Structural steel reinforced concrete beams and columns run throughout the space.

www.arche.psu.edu/thesis/eportfolio/2007/portfolios/kmf213



Table of Contents

Executive Summary	4
Building Statistics	5
Lighting Depth	8
Introduction	9
Lobby	10
Lobby Option B	23
Canopy	26
Theatre	36
Office	52
Electrical Depth	68
Electric and Control Plans	69
Panelboards	75
Device Coordination Study	89
Copper versus Aluminum Wire Analysis	90
Compact Fluorescent Analysis	93
Mechanical Breadth	97
Acoustical Breadth	105
Conclusions	112
References	113
Acknowledgments	114
Appendix A-1	115
Appendix B-1	205
Appendix B-2	222
Appendix C	231



Executive Summary

The Woolly Mammoth Theatre Company's mission is to make new, edgy and provocative productions. This sets the stage for the theatre's theme of a 'transparent theatrical laboratory". All of the spaces which are normally hidden from patrons, including rehearsal halls, classrooms, offices and other support spaces, are open to be seen. This will give the patrons a "behind-the-scenes" look at making a live theater production. Throughout the space this theme is portrayed through the lighting, style of architecture and the finishes.

The first part of this report will consist of an in-depth study of the lighting design for the building. The overall lighting concept in the building must enhance the architectural concept. New designs are proposed for four spaces; the canopy, the lobby, the theatre and the office suite. Included in this study are conceptual design, luminaire selection, lamp and ballast selection, fixture placement and the necessary calculations.

An analysis of the building's electrical system is the next section of this report. The electrical redesign of the four newly designed lighting spaces was performed, including the electrical and control plans, and all wire and panel sizing. A complex control system was specified for the flexibility of the canopy and lobby spaces. Also provided in this section is a study of the copper versus aluminum wiring. This study shows the price of aluminum is cheaper, but it is still not feasible to change all the wiring in a building to aluminum. A comparison analysis of screw base and pin base compact fluorescents was performed as well. The advantages and disadvantages of the both were described.

The next part of the report is an analysis of the hydronic heating systems. Hydronic heating systems have many advantages over electric resistive heating systems. Hydronic systems were thoroughly researched and the advantages were described. Next the existing electric heating system for the Woolly Mammoth Theatre was analyzed for initial cost and energy consumption cost throughout a year. A new hydronic heating system was then designed for the space, including sizing of all necessary equipment. This system was analyzed for initial cost and energy consumption cost throughout a year and compared to the existing system. From this information a payback period of about six weeks was found. The hydronic heating system has many benefits over the existing heating system and has the opportunity to save the theatre company a lot of money over the course of the theatre's life.

The last analysis is an acoustic analysis of the theatre space. The theatre space is the most important space acoustically. Patrons come to the Woolly Mammoth Theatre to view productions, and expect good quality. A reverberation time calculation was done to check the existing materials in the theatre. This reverberation time was found to be slightly too high for the ideal situation of the theatre. An acoustical redesign was performed and the reverberation was then taken with the new materials. This reverberations time was the ideal time for the theatre. From this it is easy to see that material absorption is very important in the theatre environment and the change of one material in a space

The Woolly Mammoth Theatre is a very unique and complex space. It has specific design needs which must be taken into account in every aspect of the building. This report provided the integration of architecture, energy consumption, and aesthetics into many of the building systems.



Building Statistics

- Building Name: Woolly Mammoth Theater
- Location and Site: 641 D Street, NW Washington DC
- Building Occupant Name: Woolly Mammoth Theater Company
- Occupancy: 265 Seat Theater with Associated Support Spaces
- Size: 31,608 SF
- Number of Stories: 3
- Project Team:
 - Owner: Woolly Mammoth Theater Company
 - http://www.woollymammoth.net/
 - Architect: Mcinturff Architects
 - http://mcinturffarchitects.com/
 - General Contractor: Davis Construction
 - http://www.davisconstruction.com/
 - Structural Engineer: Tadger-Cohn-Edelson
 - MEP Engineer: GHT Chartered
 - Life Safety Consultant: Rolf Jensen & Associates
 - Theater Consultant: Theatre Projects Consultants
 - http://www.tpcworld.com/
 - Acoustic and Audio-Visual Consultant: Acoustic Dimensions
 - http://www.acousticdimensions.com/
 - Architectural Lighting: C.M. Kling & Associates
 - http://www.cmkling.com/
- Dates of Construction: April 1, 2004 April 26, 2005
- Overall Project Cost: 8 Million (Does not include concrete shell or historical façade which were provided)
- Project Delivery Method: Design-Bid-Build- Hard Bid



Construction:

The concrete shell of the building was provided to the theatre. It was a contribution that valued \$4.5 million. The theatre project itself totaled a cost of \$8 million. The delivery method was a design-bid-build with a hard bid. Construction started in April of 2004 and lasted a little over a year.

Structural:

The building shell was a provided CMU structural cavity with historic brick facade. Floors are metal decking with concrete fill supported by steel joists. Structural steel reinforced concrete beams and columns run throughout the space. The balcony and tech room in the theatre are on a cantilevered concrete slab.

Mechanical:

The theatre's mechanical system was designed to be totally silent. This was done by using open ended ducts that shoot air horizontally out and down from the catwalk level. No diffusers were used. This enhanced the acoustical quality and intimacy of the theatre. The space has ten air handling units ranging from 11,250 cfm to 625 cfm. There are 14 fans ranging from 33,000 cfm to 500 cfm. There are six electric heating coils running at 208 volts varying from 8200 cfm to 1200 cfm. The mechanical equipment is located sporadically throughout the building in small mechanical closets.

Lighting:

The lighting has an industrial theme. The fixtures used are simple and edgy. Black, white and aluminum track is used to accentuate walls throughout the lobby. Industrial luminaires and bare par lamps are placed in the theatre, circulation areas and office suite. Self ballasted compact fluorescents were used in many of the industrial jelly jars fixtures for a more efficient solution than incandescent. There is a 22' high light wall, which is lit with bare pars shining down behind semi-translucent laminate panels. 90% of the fixtures in the space are halogen incandescent. In the "working" spaces such as the shop, costume rooms and office suites fluorescent pendants were an efficient solution.

Electrical:

All panelboards are run at 208/120 volt. There are (2) 2000A switchboards. One is servicing all mechanical equipment and motors, while the other is servicing the lighting/dimming and general equipment. There is one transformer used for two fused disconnect switches, which control the audio visual equipment.

Transportation:

There is one passenger elevator for patrons in the theatre. The elevator goes from the lower level of the lobby to the street level, and up to the vestibule of the office area. The elevator is 27 KVA and protected by a 150 A circuit breaker. There is one freight elevator located in the shop. This elevator is 36 KVA and protected by a 200 A circuit breaker.



Telecommunications and Audio Visual:

The complete sound, communications and video system is split in four groups based on the different levels and type of audio visual signals. The four groups are microphone and other sensitive wiring; line level wiring; loudspeaker and control wiring; and telephone, video, control and digital systems. The theatre needed a very flexible sound system to meet its unique needs. Because of the budget restraints, the focus on the design was on infrastructure. This will give the theatre company the opportunity to expand the system in the future.

Acoustics:

The primary challenge was that the theatre is built into a residential development. Outdoor spaces and residences are located directly above the theatre, a parking garage below and a loading dock adjacent. Complete room in room construction was not feasible.

Architecture:

The theater is part of a 12 story mixed use facility including 420 condominiums and street level retail. The exterior façade and concrete shell were provided, leaving the interior to be designed by the theater company. The idea for it was to produce a "transparent theatrical laboratory". All of the spaces normally hidden from the view of patrons (rehearsal halls, classrooms, offices and support areas) are open for them to see and truly understand the "behind-the-scenes" of making a production. The interior has a rough edgy feel, using unfinished concrete and unrefined joints throughout the space.

National Codes:

- Boca Building Code 1996 Edition
- Title 12 DCMR 1999 Edition
- Accessibility- ANSI A 117 1986 Edition
- BOCA Fire Prevention 1996 Edition

Zoning:

- Downtown Development District- Permits incentives and requirements for Downtown sub-areas to a maximum FAR of 6.0 to 10.0, and a maximum height of one hundred-thirty (130) feet. This district is mapped in combination with other districts.
- Central Business District- The downtown core comprising the retail and office centers for the District of Columbia and the metropolitan area, and allows office, retail, housing and mixed uses to a maximum lot occupancy of 100%, a maximum FAR of 8.5 to 10.0, a maximum height of 110 feet and 130 on 110-foot adjoining streets.



Lighting Depth



Lighting Depth

The Woolly Mammoth Theatre Company is a very unique group. They have a mission to provide new and edgy productions to the community. Therefore, when designing their first permanent facility, the "personality" of the building must go along with who they are. The architectural concept for the building is a 'transparent theatrical laboratory". Throughout the building, spaces normally hidden from patrons, including rehearsal halls, classrooms, offices and other support spaces are open to be seen. This will give the patrons a "behind-the-scenes" look at making a live theater production.

The lighting concept in the Woolly Mammoth Theatre must enhance the architectural theme. The lighting design concept throughout the building will be to make the spaces **Come Alive**. The finishes in the space are very grim, being white painted walls, concrete floors and ceilings, and concrete block walls. There are only a few select colors in each space. The lighting design will add pizzazz to the spaces, making them new, edgy and provocative as the theatre company's productions are. The lighting design will highlight the architectural elements and make them stand out. All of the redesigned spaces will come alive in their own way.

There is a hierarchy of the spaces throughout the building. Three public spaces were redesigned, and one private space. The public versus private space design criteria is very different. The lobby is the most important public space in the redesign. It is the most edgy and eye-catching. The next public space is the entrance. It foreshadows for patrons what is to come inside the building. The last public space is the theatre space. The house lighting was redesigned. It is the most subdued public space because in the theatre itself, the production is what is important and should not be outdone. The private space that was redesigned was the office suite. This space is only for the employees of the theatre. The office will come alive in a softer way.

Color

Awake

Dynamic

Vibrant

Flashy



Hi-Tech

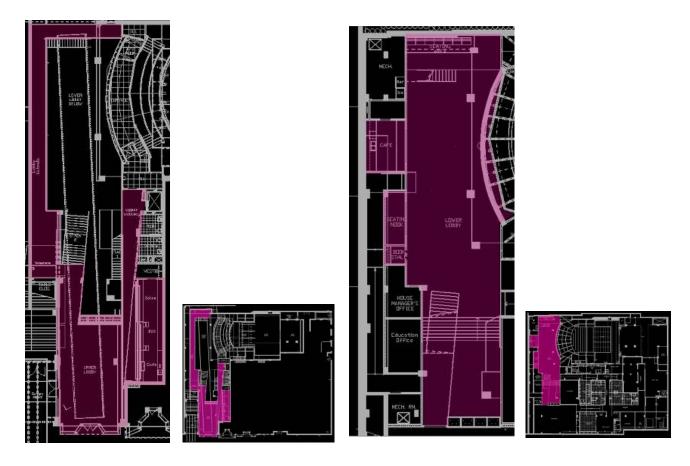


Lobby

Space Overview

As patrons enter the lobby, they are in for a huge surprise. The theater is said to get lost in the cityscape; but once you are inside everything becomes clear. Entering from street level, patrons come in on the second floor. The lobby has a tunnel like feel, extending 130' back and varying widths between 20'-40'. The finishes are unfinished, looking industrial and edgy. There are only a few key colors in the space. On this level there are a ticket booth and café. There is a long balcony, referred to as the "lobby catwalk", descending the entire length of the space where seating is available and art is on display. Also extending the length of the space is a white gypsum board ceiling panel. This helps to draw the eye to the back of the space.

Moving further into the space, stairs will take patrons down to the first level where the lobby is a double-heighted space. The stairs and bridges are cleverly placed to invite movement between the first and second levels of the lobby. On this level there are seating areas, a book stall, a café and the entrances to the orchestra seating. When inside the space, there is no mistake where the theater is. A 22' high curved polycarbonate wall stands between the lobby and theater. This semi-translucent wall has a layer of mylar behind it.





reflectance = 65%

Materials in the Space

	concrete slab ceiling- clear finish	reflectance = 20%
	white painted gypsum wall board ceiling panel	reflectance = 90%
	concrete slab floor- clear satin finish	reflectance = 35%
	masonry block walls- clear finish	reflectance = 25%
	white painted gypsum walls	reflectance = 95%
	polycarbonate translucent wall- ice color	
•	wood paneling on ticket booth and both café fronts	
	plastic laminate counter tops	
	blue painted gypsum walls around ticket booth	reflectance = 65%

orange painted gypsum wall at entry seating area

Glazing

- 2 sided glazing system with vertical joints ½" thick clear laminated glazing
- Multi-walled structured polycarbonate glazing Polygal: translucent extruded polycarbonate sheet with internal ribbing and smooth flat exterior surface, Color Ice

Daylighting

Above the two story high lightwall, the curve continues with glass. This curved third story glass wall (wall to the office suite) faces an exterior glass façade wall, with a gap of three to eight feet. This gap is open to the lobby space. This technique provides daylight to shine through the third story glass façade and down into the lobby during the daytime. A daylight study was not performed because all of the direct sunlight entering the lobby space hits the light wall. The daylighting does provide ambient light for the daytime, and therefore the theatre company can dim the lighting during those hours.

Design Criteria

General

In this lobby many tasks will be taking place. Tickets, programs and souvenirs will be bought; and snacks will be eaten. The lobby will provide a space for patrons to wait before and after performances. Glare should be completely avoided.

Color rendering and facial modeling are all very important in the lobby. Patrons will be spending time in this space and should look beautiful. There should be points of visual interest and sparkle in the room. This will lead the eye through the space and keep patrons interested.

Illuminance and Luminance Values

According to the IESNA, between 15 and 20 footcandles of horizontal illuminance is desirable for lobbies and foyers in theaters of live productions. The artwork and posters in the space should range from 70 to 350 cd/m^2, depending on surrounding brightness.



Power Density

According to Ashrea 90.1 (2004), using the space by space method for a lobby of a performing arts building, 3.3 W/SF are allowed.

Schematic Design/Design Intent

Design Goals

- Color
- Sparkle
- Rhythmic Invites Movement and Flow
- Most Exciting Space

The lobby of the Woolly Mammoth Theatre will be the first interior space patrons will see. The appearance should be pleasing to the eye, feeling inviting and exhilarating. Its edgy design will draw people into the space. Because the majority of the finishes are white and unfinished concrete, colored light will help the space come alive. This light will spread throughout the space giving the lobby a glow of color. The lobby's main character comes from its architecture: the way the stairs are placed, the balconies over looking the lower floor, the small nooks and book stalls, and the gypsum panel extending into the space. These architectural features will be highlighted and be made to sparkle wherever possible.

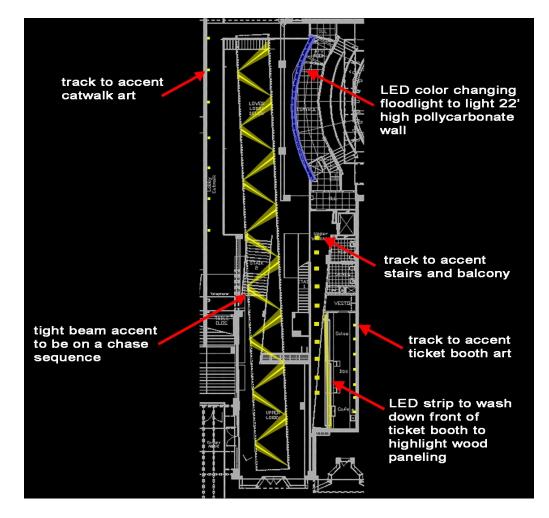
The architecture also lends itself to movement, and therefore the lighting will keep with that theme. The lighting should be very rhythmic, which will encourage flow and movement. The space will have brightness patterns that attract the eye, as well as influence flow through the space. There should be many layers of light throughout the space, with visual clues as to where to go. This will guide patrons through the tunnel-like dimensions. This space will be the height of experience for the theatre, until the patrons actually see the performance in the theatre.



Concept Photos



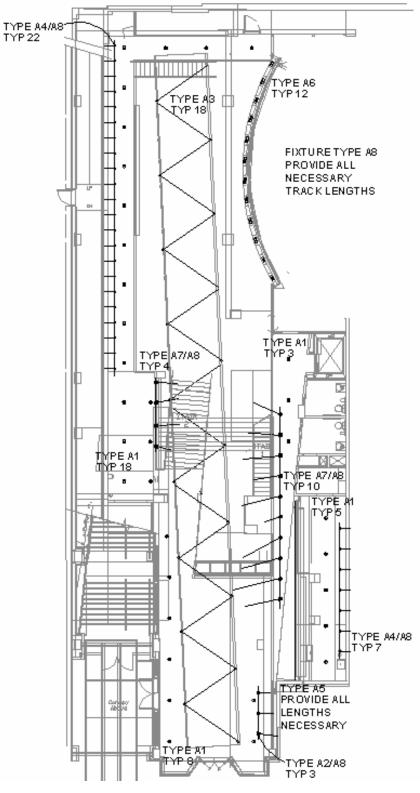
Concept Diagram





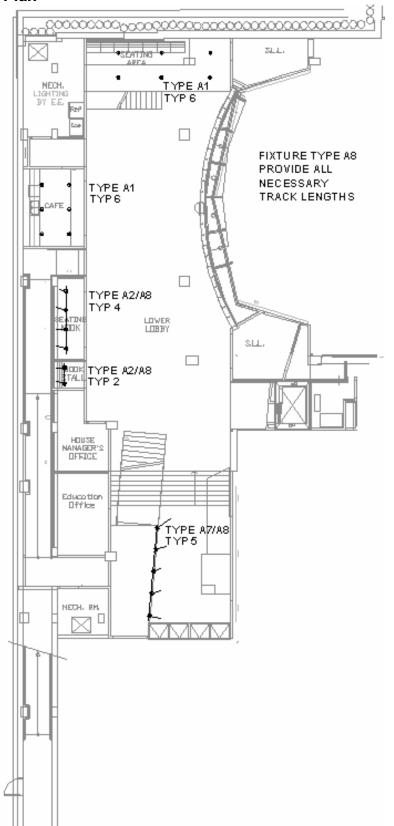
Final Design

Second Floor (Street Level) Lighting Plan





First Floor Lighting Plan





			LOBBY LUMINAI	RE SCHEDULE		
FIXTURE TYPE	PICTURE	DESCRIPTION	LAMP	LAMP MANUFACTURER		NOTES
A1		CFL PENDANT	SYLVANIA CF32DT/E/IN/835/ECO	LIGHTOLIER	406U2-416SR	LOCATION: LOBBY DESIGN A
A2	The second	PAR TRACK FIXTURE	SYLVANIA 50PAR38/HAL/WFL30	LSI	236-00-S	LOCATION: LOBBY DESIGN A
A3	1	GYPSUM PANEL MONO POINT FIXTURE	GE Q71MR1&C/NSP15	LSI	260-5E	LOCATION: LOBBY DESIGN A
A4	No.	ART ACCENT TRACK FIXTURE	GE Q50MR1&C/FL40	LSI	260-00	LOCATION: LOBBY DESIGN A
A5		LED STRIP	1 WHITE LEDS INCLUDED	ARDEE	WW2A LAMPING PR SERIES MOUNTING	LOCATION: LOBBY DESIGN A
AG		LED COLOR CHANGING FLOOD LIGHT	36 RGB LEDS INLCUDED	COLOR KINETICS	COLORBLAST 12 116-000012-02	LOCATION: LOBBY DESIGN A
A7		PAR TRACK FIXTURE	SYLVANIA 100PAR38/CAP/IR/FL40	LSI	290-00	LOCATION: LOBBY DESIGN A
A8	•• •	TRACK	NIA	LSI	LSI 120/250V TRACK SILVER FINISH	LOCATION: LOBBY DESIGN A

Fixture, lamp and ballast cut-sheets can be found in Appendix A.



		Ligł	nt Loss Fa	actors			
Fixture	Cleaning Interval	Category	BF	LLD	LDD	RSDD	LLF
	12 months						
A1	(clean)	IV	1.00	0.86	0.94	0.97	0.78
	12 months						
A2	(clean)	IV	1.00	0.90	0.94	0.97	0.82
	12 months						
A3	(clean)	IV	1.00	0.90	0.94	0.97	0.82
	12 months						
A4	(clean)	IV	1.00	0.90	0.94	0.97	0.82
	12 months						
A5	(clean)	IV	1.00	1.00	0.94	0.97	0.91
	12 months						
A6	(clean)	IV	1.00	1.00	0.94	0.97	0.91
	12 months						
A7	(clean)	IV	1.00	0.90	0.94	0.97	0.82
RCR Calc	ulated to be 3.1 Sp	ace Assun	ned to be \	/ery Clean			

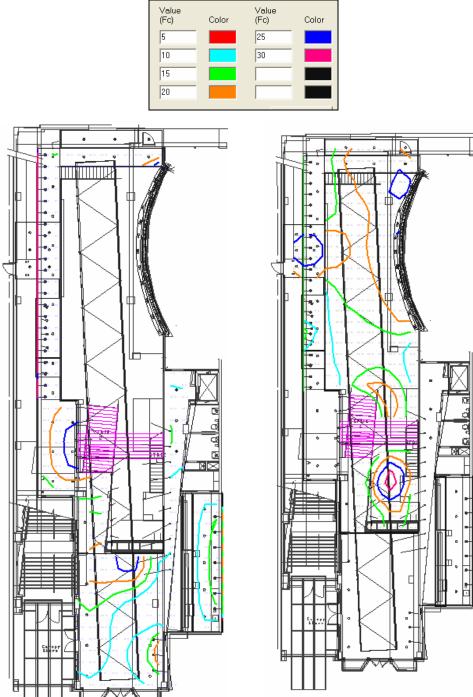
The cleaning interval for the lobby was assumed to be 12 months since the building is owned and maintained by the theatre company directly. The space was assumed to be a clean environment because there are no surrounding spaces where adhesive or ambient dirt would be generated.

	Power Density										
Fixture	Quantity	Wattage	Total Wattage	SF	W/SF						
A1	46	39	1794								
A2	9	50	450								
A3	18	71	1278								
A4	29	50	1450								
A5	230	1	230								
A6	12	50	600								
A7	19	100	1900								
			7702	5182	1.49						

Using the input wattages for the specified ballast and lamps, the power density for the lobby is 1.49 W/SF. This is significantly under the 3.3 W/SF allowed for the lobby of a performing arts building.



Calculation Grids

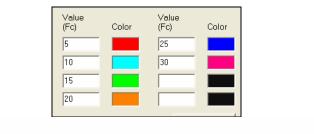


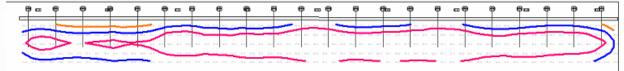
Numeric Summary									
Label	CalcType	Units	Avg	Max	Min	Avg/Min			
Lower Level B_Floor	Illuminance	FC	17.36	32.1	10.5	1.65			
Lower Level_Floor	Illuminance	FC	17.47	29.4	5.0	3.49			
Upper Level_Floor	Illuminance	FC	14.86	28.1	4.8	3.10			

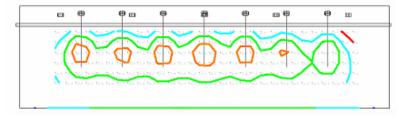


The average illuminance of the second floor (street level) of the lobby is 15 fc, with a maximum of 28 fc and a minimum of 5 fc. The area with the lowest light levels, about 10 fc, is directly near the entrance. This is acceptable because the entrance wall and front façade are both glass. Therefore during the day, daylight will illuminate this area. During the evening, the canopy lighting will illuminate this area. The balcony catwalk has an even distribution of 17 fc. The second floor should be slightly dimmer than the first, because there should be more contrast with the accenting of the art and gypsum panel.

The first floor illuminance is slightly higher than the second floor, having an average of 17 fc. Having the first floor illuminance level higher will encourage patrons too look up at the gypsum panel and art running through the space.







Numeric Summary						
Label	CalcType	Units	Avg	Max	Min	Avg/Min
Catwalk_Art	Illuminance	FC	29.07	39.2	16.2	1.79
Ticket Booth_Art	Illuminance	FC	14.62	23.0	2.7	5.41

The catwalk are has an average of 30 fc, with a very even distribution of 1.79 average to minimum fc. This is important because the art of the catwalk is not constant. The even distribution will let the theatre company place any type or size art display on the wall. The ticket booth art has a lower illuminance average of 15 fc, because the ticket booth floor has a lower illuminance than the catwalk floor. The art lighting is not completely evenly distributed. There are seven permanent pictures hanging on the wall, each fixture is accent one picture. These pictures are never removed, and therefore each one can be highlighted more dramatically.



Control

The lobby lighting will be on a standard theatrical dimming rack controlled by an architectural interface. The lobby lighting will be zoned according to type of fixture and area of the room. All lobby fixtures will be controlled by this system. The accent fixtures lighting the gypsum ceiling panel will be on a chase sequence (first fixture will fade to a higher level, then second, then third and so on). The sequence will run slow, being subtle. This will make the space have a dynamic feel and will guide patrons into the tunnel like room. The LED floodlights lighting the polycarbonate wall will be color changing, so they can be set on one color, or a color changing sequence. When they are color changing, the sequence will be very slow, so it does not compete with the accents on the gypsum panel.

The lobby will have many different lighting scenes for different circumstances. Four typical preset scenes useful to the theatre company would be night performance, day performance, day ambient and night ambient. These presets could also be altered for specific needs of the event as well.



Renderings









Conclusion

The lobby is an architecturally complex space. The lighting design must work with the architecture to enhance the space. The suspended gypsum panel is one of the most important features in the lobby. The accent lighting on the stark white panel will guide patrons into the space. Once led to the back of the lobby, patrons will see the 22' high lightwall. The panel and this wall are completely contrasting, adding dimension to the space. The panel is white, long and narrow, straight, and unevenly lit with accents. The light wall is robust, colored, curved and evenly distributed. These two elements are very prominent and define the space. The track used throughout the space highlights many unique features of the architecture including stairways, walls, balconies and artwork. The orange accent wall and the wood paneling on the ticket booth were lit to draw attention to their color and texture. The new design for the lobby is a very exciting space, and with the new lighting design the space comes alive.

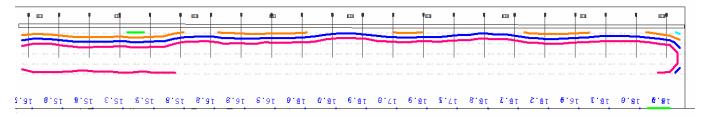


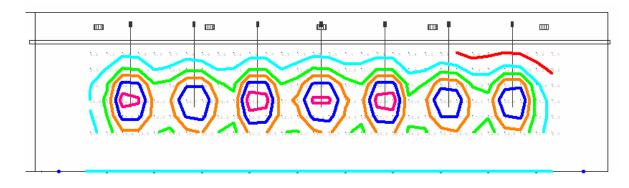
Lobby Design 2

In the second design for the lobby, the track fixtures accenting the catwalk and the ticket book art were changed from 50 W MR16 fixtures to 35 W LED fixtures. The LED fixture is fixture type A8. The fixture cut-sheet can be found in Appendix A. The design will be critiqued on performance and cost/efficiency.

Performance







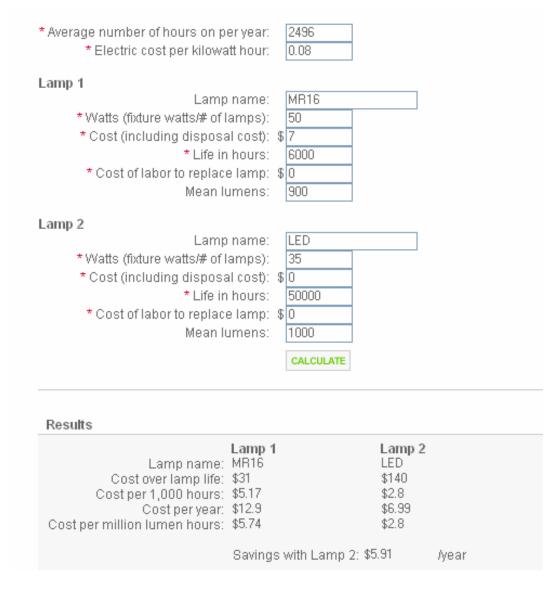
Numeric Summary						
Label	CalcType	Units	Avg	Max	Min	Avg/Min
Catwalk_Art	Illuminance	FC	32.11	44.6	13.7	2.34
Ticket Booth_Art	Illuminance	FC	16.17	33.1	2.5	6.47

The average illuminance on both the catwalk art and the ticket booth art is only about 1 fc to 2 fc higher using the LED fixture. This is because the LED fixture's rated lumens are 100 lumens more that the MR16 fixture. Due to this fact, the LED fixture could actually be compared with a 71 W MR16. The LED fixture provides a very even distribution on the catwalk art, and a diverse distribution on the ticket booth art, just as the MR16 fixture does. The LED fixture has 100% lumen maintenance, whereas the MR16 only has 90%. The CCT and CRI of both fixtures are equivalent.



Efficiency and Cost

The rated lamp life for the LEDs is 50,000 hours. This is much longer than the lamp life of 6,000 hours for the MR16. The wattage of the LED fixture is also less, 35W compared to the 50 W for the MR16. Below is a calculation of the money saved on electricity with the new design, using the LED track versus the MR16 track.



According to this energy analysis, every LED fixture saves about \$6.00 per year. For the lobby design there are 29 fixtures. This would give a total savings of \$174 per year. This does not take into account the initial cost of the fixture (at least \$200 more than the MR 16 fixture).



In the calculation below, the initial cost of the LED fixture is taken into account, and a payback is generated for the new system.

* Average number of hour * Your electric cost per * Watts per fixture used in co Watts per fixture used in prop Cost to upgrade	kilowatt hour: \$.08 urrent system: 50 osed system: 35 each fixture*: \$ 200		
results	_	ran Caránas (mith	proposed system)
Cost of Electricity			ninnean everann

In this calculation, the efficiency of the fixture does not outweigh the extra cost. A payback of 67 years is too long of a payback. If there were more fixtures being replaced in the space, or if the MR16 fixtures were using 71 W lamps, the benefits would have been greater.

Conclusion

LEDs are the newest technology in lighting design. They are getting better and better every day, with more options for fixtures, brighter lamps and better dimming solutions. Yet they are not the best solution in every case. In this design, the LEDs would save a small amount of money on electricity, but the payback of the initial cost is probably longer than the system will even be installed. Therefore the LEDs should not be used. The reliable, cheap and versatile MR16 should be kept for the track lighting of the catwalk and ticket booth artwork.



Canopy

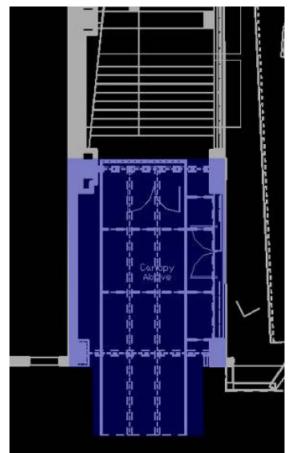
Space Overview

The Woolly Mammoth Theatre sits on a busy street in downtown DC. It has a historic brick façade facing this street and remains very low-key. The doors to this storefront remain closed. To enter the theatre, patrons must go around the corner.

The alley does have a canopy to make it more apparent. The canopy is made of black steel columns/beams and a plastic glazing panel. There is also an area to hang advertisements for upcoming shows. Yet this canopy is not glitzy or glamorous. It has an industrial feel, which will prevail throughout the space.

The canopy will direct patrons to the entrance of the theatre. The appearance of the luminaires will foreshadow what will be seen throughout the building. There should be accent lighting on the wall of the adjacent building where posters are being displayed. This area should have sparkle and be eye-catching. The steel and glass surfaces should appear to be beautiful.

The majority of the theatre company's shows are in the evening hours. The theater should blend in to the cityscape during the "work day". Once it becomes dusk, the full view of the theatre should become apparent from the outside.







Materials in the space

- black steel structure
- brick walkway
- brick and glass façade of theatre on one side
- brick adjacent building facade

Glazing

polycarbonate panel

Polygal: translucent extruded polycarbonate sheet with internal ribbing and smooth flat exterior surface, Color Ice

Horizontal Illuminance

According to IESNA Handbook there should be 5 footcandles of horizontal illuminance on the ground. There should also be at least 3 footcandles of vertical illuminance.

Power Density

According to the ASHREA 90.1 (2004), using the Space- By- Space method, the power density allowed for an entrance canopy is 1.25 W/SF.

Schematic Design/Design Intent

Design Goals

- Eye-catching
- Peeks Interest
- Depth
- Foreshadow What Is Inside

The entrance to the Woolly Mammoth Theatre is located in an alleyway. To make the canopy eye-catching during hours of operation, color and texture were used. The RGB LED downlights will be able to be a variety of colors. This will peek the interest of onlookers. They will want to know what is inside the building. The two theatrical fixtures will be very close to white light. They will have gobos to add texture to the canopy floor. The layering of light will give the space depth. All of these features will foreshadow the color and texture to be seen once entering the building.

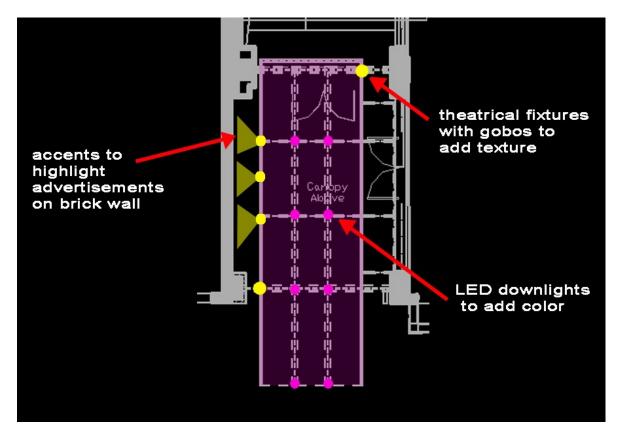
reflectance = 20% reflectance = 35%



Concept Photos



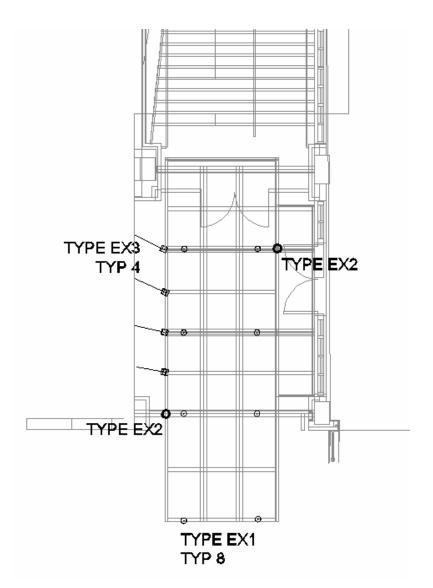
Concept Diagram





Final Design

Lighting Plan





FIXTURE TYPE			LAMP	MANUFACTURER	CATALOG NUMBER	NOTES					
EX1		RGB LED SPOTLIGHT	31 LUXEON HIGH LUX LEDS	TIR	DES-30-RGB-BLK-DMK	LOCATION: CANOPY					
EX2		THEATRICAL FIXTURE PROVIDE WITH SPECIFIED GOBO	SYLVANIA HPL375	ETC	426J-400PH-M	LOCATION: CANOPY					
EX2A		ROSCO	NłA	ROSCO	DOT BREAKUP 77053-0660	LOCATION: CANOPY					
EX3	FRM	YOKE MOUNTED HALOGEN CYLINDER	SYLVANIA 50PAR30CAPIRNFL25	LSI	FB-30-B	LOCATION: CANOPY					

All fixture, lamp and ballast cut-sheets can be found in Appendix A.



	Light Loss Factors										
Fixture	Cleaning Interval	Category	BF	LLD	LDD	RSDD	LLF				
EX1	12 months (medium)	IV	1.00	1.00	0.89	0.94	0.84				
EX2	12 months (medium)	IV	1.00	0.90	0.89	0.94	0.75				
EX3	12 months (medium)	IV	1.00	1.00	0.89	0.94	0.84				
RCR Calc	ulated to be 5.6 Sp	bace Assun	ned to be C	lean							

The cleaning interval for the canopy was assumed to be 12 months since the building is owned and maintained by the theatre company directly. The space was assumed to be a medium environment. The canopy is an exterior space, but is in between two large buildings in an alley. Therefore the amount of dirt would generated is not high.

	Power Density										
Fixture	Quantity	Wattage	Total Wattage	SF	W/SF						
EX1	8	35	280								
EX2	2	375	750								
			1030	550	1.87						
EX3	4	50	200	550	0.36						

Using the input wattages for the specified ballast and lamps, the power density for the canopy is 1.87 W/SF. This is slightly over the allowed 1.25 W/SF. Taking into account the power allowances of the other redesigned spaces, all of which were significantly under the allowed power density, the canopy being over is acceptable. Fixture type EX3 is an exception in the power density calculation because it is an integral part of advertising.



Calculation Grids

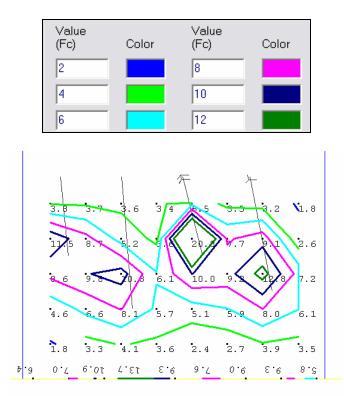


Numeric Summary						
Label	CalcType	Units	s Avg	Max	Min	Avg/Min
Wall	Illuminance	Fс	6.19	20.8	1.8	3.44
Ground	Illuminance	Fс	6.24	13.7	2.0	3.12

The average illuminance of the canopy floor is 6 fc, which fulfills the suggested value of 5 fc. The lighting is evenly distributed over the canopy floor with a average to minimum fc ratio of 3.12. This is ideal because the colored light should be as even as possible to give the canopy space a glowing feel. The theatrical fixtures with gobos were not taken into account in this calculation. They will add light to the space, but will be used strictly for texture.



Advertisements on Brick Facade



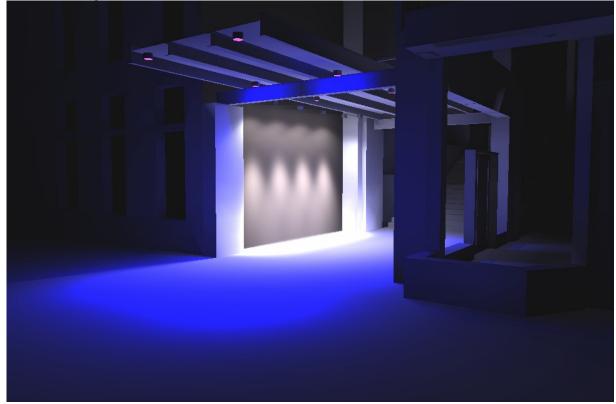
The aiming of the accents on the brick façade is adjustable, and can be changed with the size of the advertisement. In this calculation the accents were arbitrarily aimed as if there were two advertisements. This façade has significantly more illuminance than the canopy area itself. This will direct the patron's attention to the advertisement.

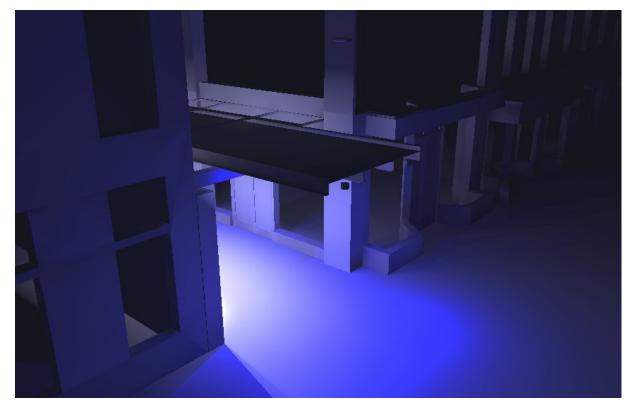
Control

The canopy lighting will be controlled by the same system as the lobby. This will allow the LED fixtures to be color changing on a sequence. Also the accents for the advertisements and the theatrical fixtures can be dimmed. The exterior zones will not be on during the day, unless it is a very dark day. If necessary the advertisement lighting can be used to add light to the space during daytime hours. All the exterior fixtures will be turned on at dusk.



Renderings







Conclusions

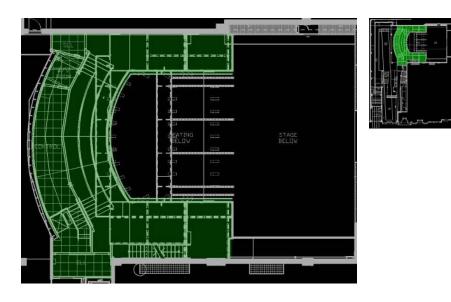
The canopy of the Woolly Mammoth Theatre is located in an alley off of the main road. This adds to the mystery of the theatre, because it is almost lost in the cityscape. During the day the theatre will blend in with the surrounding buildings, but at night the space will come alive. The lighting design for the canopy is edgy, using high-tech fixtures and control. Color and texture are used to grab the attention of outsiders. The space shows people a glimpse of what can be seen inside the building. The new design for this space fulfills the design criteria as well as embraces the lighting design concept.



Theatre

Space Overview

Entering the theatre through the main entrance on the orchestra floor, there is no grand entrance. The doors are awkwardly placed behind a concrete column. The theme of the theatre is to be intimate and edgy. It is a 6,000 SF space with seating on two levels, 187 orchestra and 78 balcony plus standing room. The theatre has a courtyard configuration designed to connect the audience and actors in this cozy setting. The space is high and deep, making it very flexible. The main finish throughout the theatre is black. The only color in the space is the maple seat backs, the wood slats on the balcony fronts and the red accent wall at the back of the theatre.







Materials in the Space

- concrete slab ceiling- clear finish
- concrete block walls- clear finish
- concrete block walls- black stained finish
- concrete wall- clear finish
- concrete wall- black stained finish
- red painted gypsum wall
- concrete slab floor- clear satin finish
- carpet- dark gray
- light wood paneling on balcony fronts
- black upholstered seats
- black metal catwalks
- metal railings

Design Criteria

General

Before and after a performance, the theatre house lighting will be on. This lighting should be diffuse and comfortable. In this time patrons will be entering and exiting the theatre, finding their seats, reading programs and waiting for the performance to begin.

The lighting should have some accenting or visual interest, as patrons may be waiting lengths of time in their seats. The space should appear to be at a high quality in appearance. Color rendering and facial modeling are very important to achieve this.

The general lighting should be on dimming control. Also "panic" switches independent of dimmers and switches should be provided to bring on selected house lights in case of an emergency. Emergency house lighting, exit lighting, and aisle lighting are all necessary.

Illuminance and Luminance Values

A minimum of 10 to 20 footcandles should be maintained throughout the seating area when a performance is not taking place. Higher illuminances of 30 footcandles are required to perform visual tasks, such as rehearsals, cleaning and maintenance of the space. During performances emergency light levels must be 0.2 footcandles.

Power Density

According to Ashrea 90.1 the power density for an audience/seating area in a performance space is 1.8 watts/sq. ft.



reflectance = 20%reflectance = 20%reflectance = 10%reflectance = 20%reflectance = 10%reflectance = 30%reflectance = 30%reflectance = 10%



Schematic Design/Design Intent

- Intimate
- Subdued
- Sparkle

The lighting for the theatre must come alive in a different way than the previously discussed spaces. The main function of the theatre is to hold the performance. For that reason the lighting before and after the show should not compete with the show itself. The house lighting should prepare the audience for the production. Staying with the architectural concept of the theatre, the lighting should enhance the intimate feeling of the theatre. Sparkle should be added to the space. This will be accomplished by expressing the equipment and the actual theatre mechanics to enhance the space and add sparkle. The lighting of the theatre will be subtle, yet still make the space come alive.

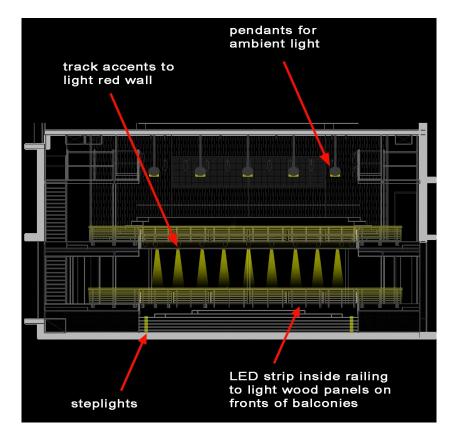
Concept Photos





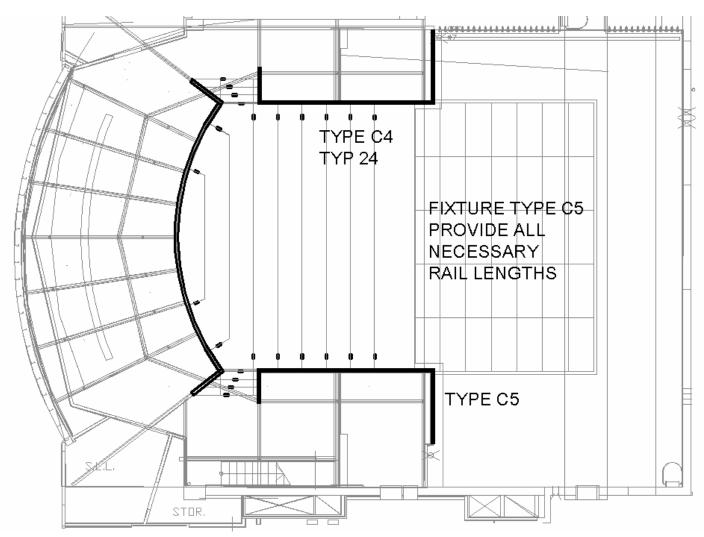


Concept Diagram



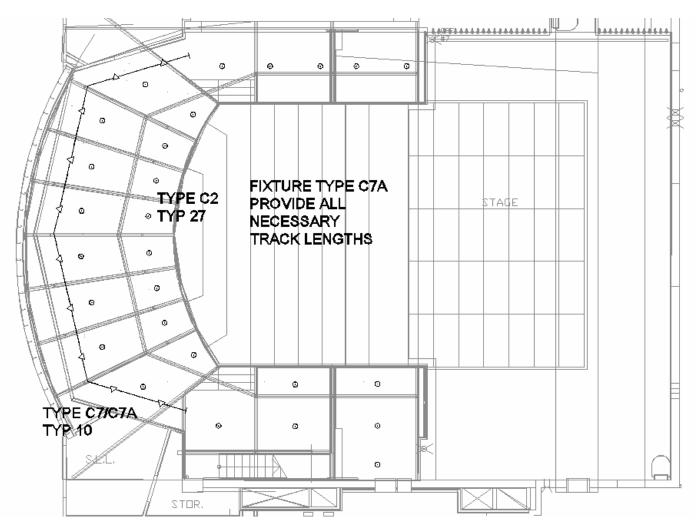


Final Design Orchestra Level Lighting Plan



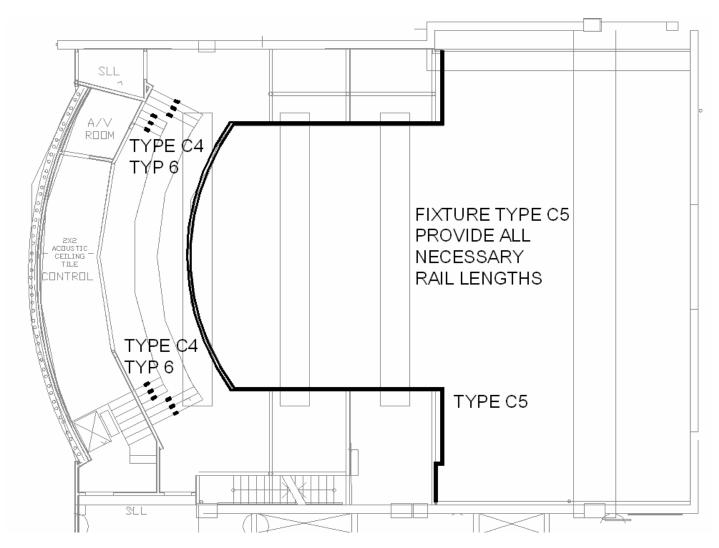


Orchestra Level Lighting RCP



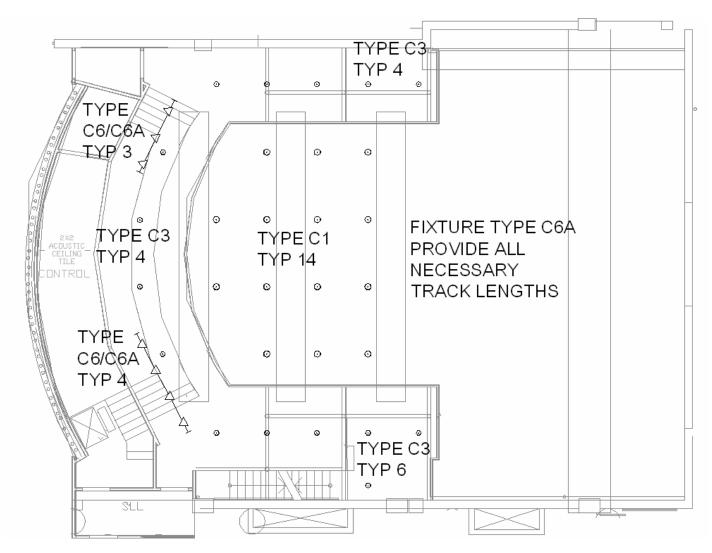


Balcony Plan





Balcony Level RCP





	THEATRE LUMINAIRE SCHEDULE									
FIXTURE TYPE	PICTURE	DESCRIPTION	LAMP	MANUFACTURER	CATALOG NUMBER	NOTES				
C1		LARGE CFL PENDANT	SYLVANIA CF42DT/E/IN/835/ECO	DELRAY	7713342	LOCATION: THEATRE				
C2		CFL SURACE CYLINDER	SYLVANIA CF32DTIE/IN1835/ECO	KURT VERSEN	P913-DM	LOCATION: THEATRE				
С3		CFL PENDANT CYLINDER	SYLVANIA CF42DTie/INi835/ECO	KURT VERSEN	P914-DM-ES 6' STEM	LOCATION: THEATRE				
C4		STEPLIGHT	SYLVANIA 20T4Q/CL/AX	LUMIERE	1201-LA	LOCATION: THEATRE				
C5		RAILING LIGHT	LED 2WIFT	IO LIGHTING	LUXRAIL PROVIDE ALL NECESSARY LENGTHS	LOCATION: THEATRE				
C6		SUSPENDED TRACK FIXTURE	SYLVANIA 120PAR38/HAL/NFL25	ERCO	7746.000 BLACK	LOCATION: THEATRE				
C6A		TRACK	NłA	ERCO	ERCO 2- CIRCUIT TRACK PROVIDE ALL NECESSARY LENGTHS	LOCATION: THEATRE				
C7		ACCENT WALL TRACK	GE Q50MR1&C/FL40	BUSCHFELD DESIGN	SHOP V-15 35703	LOCATION: THEATRE				
C7A		TRACK	NIA	BUSCHFELD DESIGN	SHOPT V-15 PROVIDE ALL NECESSARY LENGTHS	LOCATION: THEATRE				

All fixture, lamp and ballast cut-sheets can be found in Appendix A.



		Lig	yht Loss F	actors			
Fixture	Cleaning Interval	Category	BF	LLD	LDD	RSDD	LLF
	12 months						
C1	(clean)	IV	1.00	0.86	0.95	0.97	0.79
	12 months						
C2	(clean)	IV	1.00	0.86	0.95	0.97	0.79
	12 months						
C3	(clean)	IV	1.00	0.86	0.95	0.97	0.79
	12 months						
C4	(clean)	IV	1.00	0.90	0.95	0.97	0.83
	12 months						
C5	(clean)	IV	1.00	1.00	0.95	0.97	0.92
	12 months						
C6	(clean)	IV	1.00	0.90	0.95	0.97	0.83
	12 months						
C7	(clean)	IV	1.00	0.90	0.95	0.97	0.83
RCR Ca	culated to be 4.1	Space As	sumed to	be Very Cl	ean		

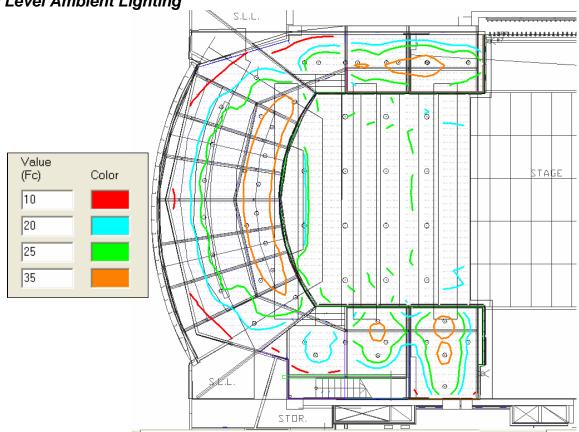
The cleaning interval for the lobby was assumed to be 12 months since the building is owned and maintained by the theatre company directly. The space was assumed to be a clean environment because there are no surrounding spaces where adhesive or ambient dirt would be generated.

	Power Density									
Fixture	Quantity	Wattage	Total Wattage	SF	W/SF					
C1	14	148	2072							
C2	27	39	1053							
C3	15	50	750							
C4	24	20	480							
C5	240	2	480							
C6	7	120	840							
C7	10	50	500							
			6175	6000	1.03					

Using the input wattages for the specified ballast and lamps, the power density for the lobby is 1.03 W/SF. This is under the 1.8 W/SF allowed for audience seating areas of a performing arts building.



Calculation Grids Orchestra Level Ambient Lighting

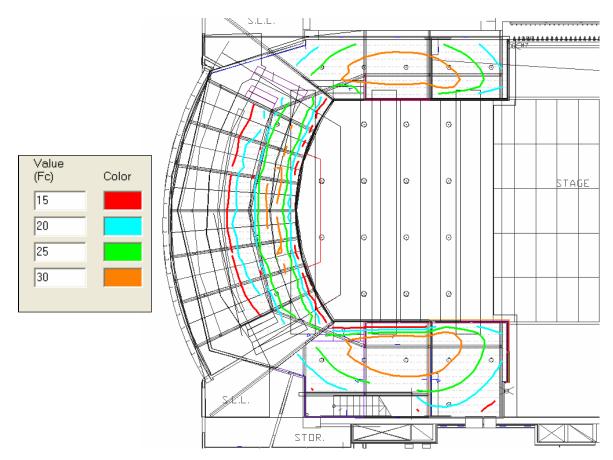


Numeric Summary							
Label	CalcType	Units	Avg	Max	Min	Avg/Min	
First Floor_Row K, L, M	Illuminance	Fc	25.26	43.3	6.8	3.71	
First Floor Row C	Illuminance	Fc	23.76	25.6	19.8	1.20	
First Floor Row A	Illuminance	Fc	20.68	24.0	16.5	1.25	
First Floor Row B	Illuminance	Fc	22.75	24.4	19.8	1.15	
First Floor Row D	Illuminance	Fc	25.33	27.0	21.9	1.16	
First Floor Row E	Illuminance	Fc	25.88	27.8	21.3	1.22	
First Floor Row F	Illuminance	Fc	27.01	28.8	22.8	1.18	
First Floor Row J	Illuminance	Fc	28.27	30.9	25.1	1.13	
First Floor Row H	Illuminance	FC	27.29	32.7	16.5	1.65	
First Floor Row G	Illuminance	Fc	27.88	30.5	20.8	1.34	
First Floor North Entrance	Illuminance	Fc	18.43	34.6	5.2	3.54	
First Floor South Entrance	Illuminance	FC	16.19	22.6	5.8	2.79	
First Floor North Boxes	Illuminance	Fc	26.82	42.8	10.6	2.53	
First Floor South Boxes	Illuminance	Fc	24.37	39.8	8.3	2.94	

The average illuminance on the orchestra level floor is between 25 and 30 fc in the seating areas. The entrance areas have an average illumination of 17 fc. These illumination levels satisfy the design criteria requirements. Before and after performances, the lighting will be dimmed to an average of 10 to 15 fc. The lighting will be on 100% when cleaning the theatre, and during rehearsals. The orchestra level has a very diffuse illumination across the space. The largest average to minimum fc ratio is 3.71, which is still an even distribution to the eye. This calculation did not take into account accent lighting.



Balcony Level Ambient Lighting

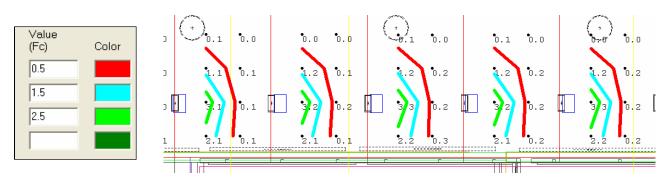


Numeric Summary								
Label	CalcType	Units	Avg	Max	Min	Avg/Min		
Balcony_Row B	Illuminance	Fc	23.41	30.6	6.1	3.84		
Balcony_Row C	Illuminance	Fc	17.68	23.7	8.5	2.08		
Balcony_Row A	Illuminance	Fc	23.17	32.4	10.0	2.32		
Balcony_North Entrance and Boxe		Fc	26.71	34.6	15.5	1.72		
Balcony_South Entrance and Boxe	sIlluminance	Fс	25.12	34.6	11.9	2.11		

The average illuminance on the balcony level floor is between 23 and 26 fc. These illumination levels satisfy the design criteria requirements. Before and after performances, the lighting will be dimmed to an average of 10 to 15 fc. The lighting will be on 100% when cleaning the theatre, and during rehearsals. The balcony level has a very diffuse illumination across the space. The largest average to minimum fc ratio is 3.84, which is still an even distribution to the eye. This calculation did not take into account accent lighting. Therefore the average illumination of Row C will be higher.

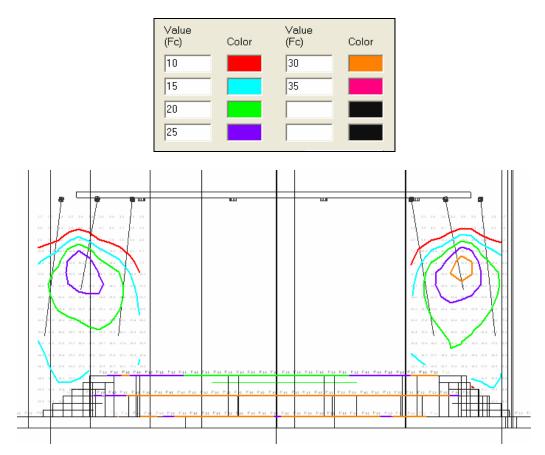


Aisle: Step lighting



The step lights in the aisle will be on during performances. They provide the necessary 0.2 fc illumination for emergency lighting.

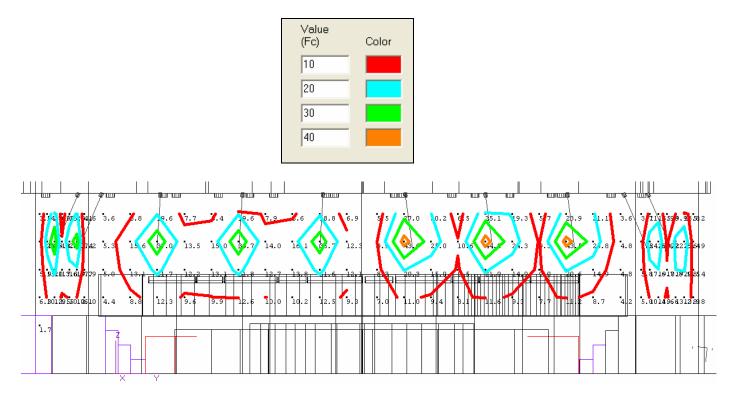
Balcony Level: Back Wall Metal Acoustical Baffles



The back wall of the balcony level is metal acoustical baffle. The finish has a high quality look, and therefore is accented with track. This adds layering of light to the space, which add depth. The wall has an uneven distribution to keep with the concept of intimate. The track fixtures are on the theatrical control system and can be dimmed.



Orchestra Level: Back Red Wall



The back wall of the orchestra level is a red painted gypsum board wall. Track is run along the wall to add small scallops of light. The track is spaced far enough apart so the wall is not uniformly lit. This accenting adds subtle visual interest and sparkle to the space. The track also gives an intimate feeling to the space.



Renderings







Conclusion

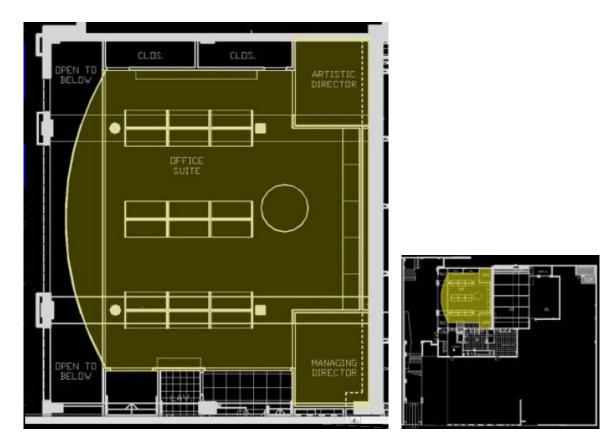
The theatre's architecture lends itself to an intimate atmosphere. The courtyard configuration establishes a strong connection with the audience and actors. The lighting of the theatre must not disrupt that connection. The lighting must also be subtle, so it does not compete with the production. In keeping with these goals, the theatre comes alive in a different way than the lobby and canopy. A low level of diffuse ambient light is provided for circulation needs. Track is used to accent the back walls of the orchestra and balcony levels, which both have finishes that are high quality and add visual interest. The metal acoustical baffles, when accented, add sparkle by highlighting the theatre mechanics. The wood panels on the fronts of the balconies are lit with a LED railing light, accenting the beautiful wood finish and bringing the focus away from the outer walls. This also keeps the space intimate. The lighting design parallels with the architectural concept of the theatre space, therefore enhancing the theatre environment.



Office

Space Overview

The office has an open plan with two private offices for the artistic director and the managing director. There are movable cubicles set up in three sections. It is a comfortable environment for the key personnel of the theatre to do work. The space is rather small but has a spacious feel. This was achieved by using glass for the surrounding interior walls connecting the office to the vestibule, hub area and exterior.



Material in the Space

- concrete slab ceiling- clear finish
- orange painted gypsum walls
- carpet- medium gray
- cubicle partitions- light

Glazing

- ½" tempered glass
- 3/8" clear laminated glazing faceted wall

reflectance = 20%reflectance = 55%reflectance = 25%reflectance = 60%

transmittance = 80% transmittance = 80%



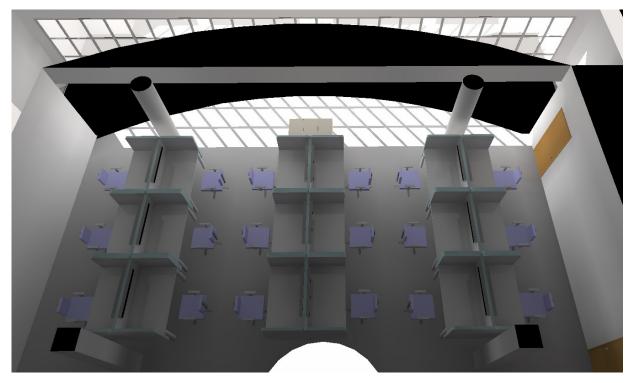
Daylighting Study

A daylighting study was conducted for the days of June 21, December 21 and March 21. These three dates are when the sky is at its highest point, its lowest point, and in the middle. The office has a full glazed wall facing west. The curved wall is 3/8" thick clear laminated glazing faceted wall. This wall is adjacent to another glass wall. The straight wall is $\frac{1}{2}$ " thick tempered glass. The office also has one diffuse skylight dome in the other half of the office area. This dome provides ambient lighting to the office with no direct sunlight entering the space.

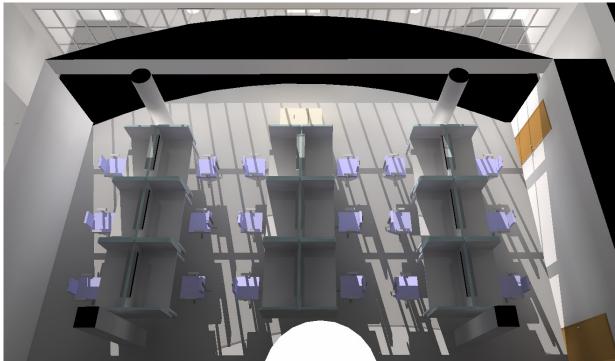
The daylighting analysis was studied for two criteria, direct light hitting the work plane and ambient light levels. It is very important direct daylight does not hit the task surface in the office space. This will cause poor visibility and discomfort. Yet direct sun when used cautiously, where non-critical task occur can be a good design feature. Patterns of light and shadows from the sun add a dynamic feature to the space. They give the occupants a sense of well-being, time and orientation.



Direct Glare March 21 3:00 PM

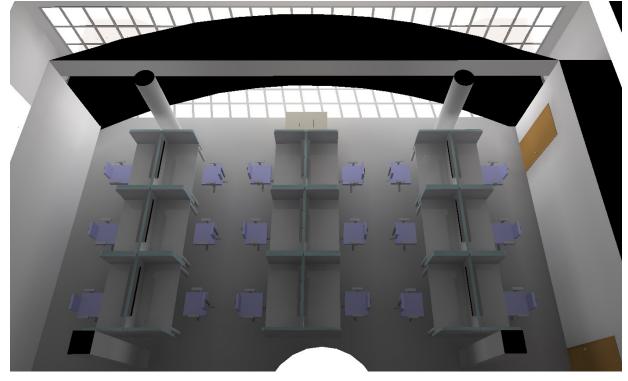


March 21 5:00 PM

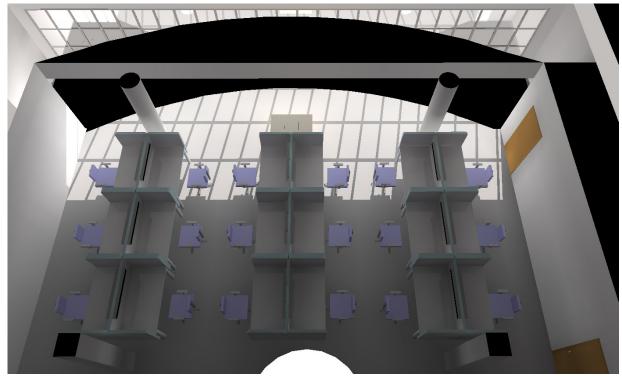




June 21 3:00 PM

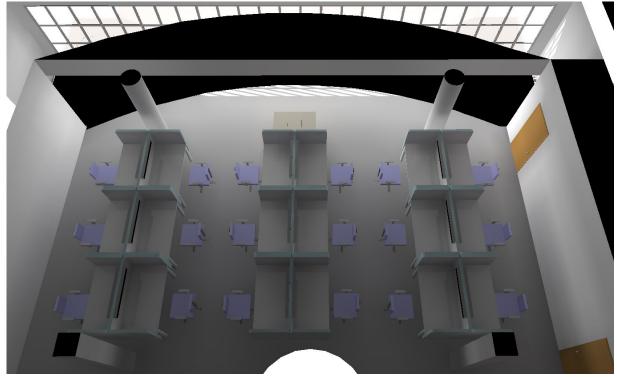


June 21 5:00 PM

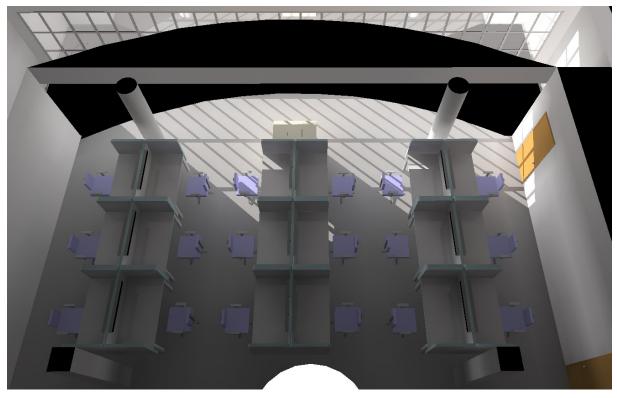




December 21 1:00 PM



December 21 3:00 PM





As seen in the previous renderings, direct glare is not a major problem in the office suite. The furniture layout of the cubicles was well thought out. The walls of the cubicles closest to the glazing block the direct glare most of the time. The few instances that the direct sunlight does hit the task surface, it did not cover much area. The direct sunlight did add a dynamic effect to the office suite, adding patterns and shadows from the mullions.

The daylight in the office suite provided a large amount of ambient light to the space. The problem is the light provided is not evenly distributed. The desks closest to the window receive daylight in most conditions. The daylight does not reach far into the space during most months out of the year. The skylight provides low levels of diffuse light to the space.

Conclusion

With the current furniture layout, direct glare is not a problem in the office suite. The direct sunlight does add a dynamic aspect to the space. Therefore the glazing does not need to be altered from the current glazing, clear with 80% transmittance. Daylight does provide a sufficient amount of light into the office suite. Yet the majority of the light is not evenly distributed over the task surface. Also only the cubicles closest to the glazing have enough illumination. It would be possible to specify a dimming system for this office suite, but it was not necessary for the space. When personal cubicles are universally controlled and dimmed, many people are unhappy. After speaking with the employees of the Woolly Mammoth Theatre Company, they did not want to install a dimming system. They workers wanted a very bright work environment. Therefore the office suite is not dimmed.



Design Criteria

General

The lighting in the office should be very comfortable. The work surfaces should be uniformly lit. In the office there is intermittent use of VDTs. Direct and reflected glare should be avoided completely. It is important to avoid having direct sunlight hit the work surface, creating glare. Also the luminances of surfaces and contrast must be carefully analyzed. The open plan office has moveable cubicles, and therefore the lighting should be flexible.

Illuminance and Luminance Values

According to the IESNA Lighting Handbook the illuminance on the work plane for an open office with intense VDT work should be 30 footcandles. The vertical illuminance should be 5 footcandles. When using VDTs, the luminance ratio of screen to paper task should be 3:1. For screen to far background the luminance ratio should be 10:1.

Power Density

According to Ashrea 90.1, the Space-By-Space Method, the power density allowed in an open plan office is 1.1 W/SF.

Schematic Design/ Design Intent

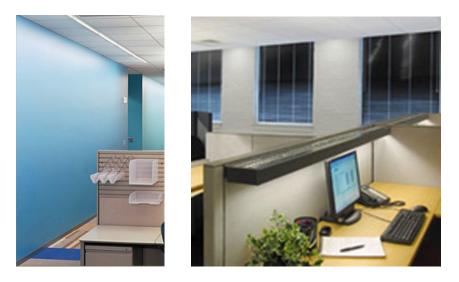
Design Goals

- Spacious
- Comfortable
- Energetic

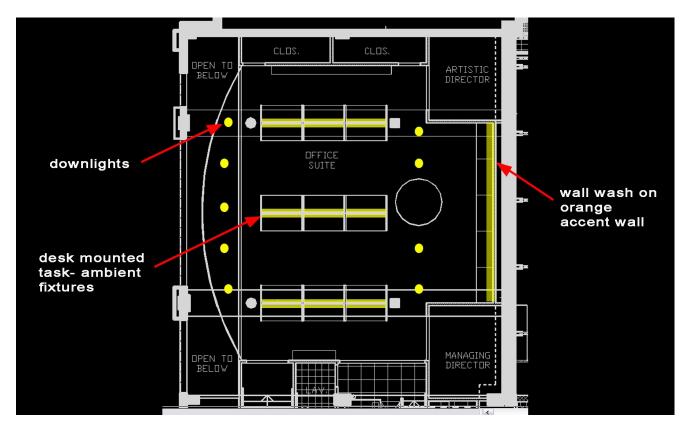
These goals were achieved in the office space by using many techniques. The office is small in square footage, and rather cramped with cubicles throughout it. Two of the four walls are made of glass, which helps to expand the feeling of the space. In the lighting of the space, the orange accent wall is washed with light. This will keep the space feeling spacious. To keep the office comfortable for the employees, direct and reflected glare must be avoided completely. This was accomplished by using a desk mounted fixture with direct and indirect light. The energetic feeling was achieved by using indirect light to stop the "cave" effect. Also there are differing light levels away from task areas to give depth.



Concept Photos



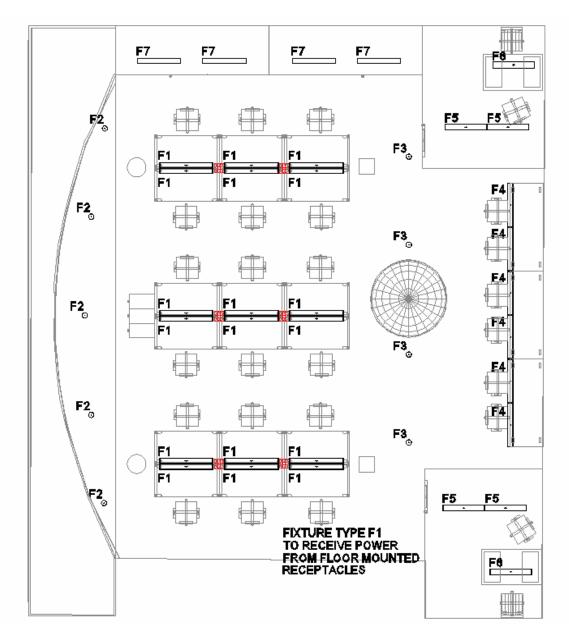
Concept Diagram





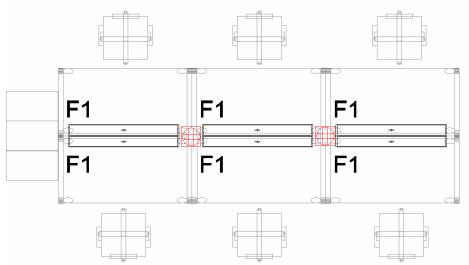
Final Design

Lighting Plan





Luminaire Detail



Fixture Type F1 task- ambient fixtures will are plug in fixtures. They will receive power from the floor mounted receptacles showed in red.



	OFFICE LUMINAIRE SCHEDULE										
FIXTURE TYPE	PICTURE	DESCRIPTION	LAMP	MANUFACTURER	CATALOG NUMBER	NOTES					
F1	F	DESK MOUNTED TASK AMBIENT FLUORESCENT	SYLVANIA FP35/835/ECO	TAMBIENT	STYLE L201	LOCATION: OFFICE					
F2		RECESSED DOWNLIGHT	SYLVANIA CF26DT/E/IN/835/ECO	LIGHTOLIER	8021-CCLP	LOCATION: OFFICE					
F3		SURFACE MOUNTED COMPACT FLUORESCENT CYLINDER	SYLVANIA CF26DT/E/IN/835/ ECO	LIGHTOLIER	CS6132	LOCATION: OFFICE					
F4	5 Mar	SURFACE MOUNTED FLUORESCENT WALL WASH	SYLVANIA FP28/835/ECO	ELLIPTIPAR	F144-T128-S-22-T-00-0	LOCATION: OFFICE					
F5		SURFACE MOUNTED FLUORESCENT DIRECT PENDANT	SYLVANIA (2) FP54/835/HO/ECO	METALUMEN	C6B4NXUK	LOCATION: OFFICE					
F6		SURFACE MOUNTED FLUORESCENT DIRECT PENDANT	SYLVANIA (1) FP54/835/HO/ECO	METALUMEN	C6A4NXUK	LOCATION: OFFICE					
F7		CLOSET FLUORESCENT STRIP	SYLVANIA F032/835/ECO	LIGHTOLIER	JS4C132	LOCATION: OFFICE					

Fixture, lamp and ballast cut-sheets can be found in Appendix A.



	Light Loss Factors									
Fixture	Cleaning Interval	Category	BF	LLD	LDD	RSDD	LLF			
	12 months									
F1	(clean)	П	1.01	0.93	0.98	0.89	0.82			
	12 months									
F2	(clean)	IV	1.10	0.86	0.94	0.96	0.85			
	12 months									
F3	(clean)	IV	1.10	0.86	0.94	0.96	0.85			
	12 months									
F4	(clean)	IV	1.04	0.93	0.94	0.96	0.87			
	12 months									
F5	(clean)	IV	0.99	0.93	0.94	0.96	0.83			
	12 months									
F6	(clean)	IV	0.99	0.93	0.94	0.96	0.83			
	12 months									
F7	(clean)	IV	0.92	0.92	0.94	0.96	0.76			
RCR Calcu	ulated to be 2.2 Sp	ace Assumed	d to be V	ery Clea	n					

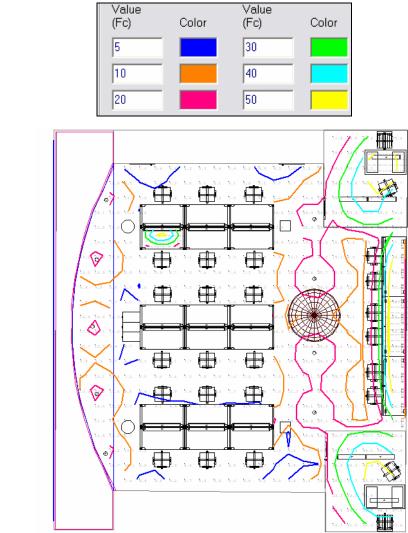
The cleaning interval for the office suite was assumed to be 12 months since the building is owned and maintained by the theatre company. The space was assumed to be a clean environment. The office suite is small area on the third floor on the theatre. It is not near any spaces that would generate large amounts of dirt.

Power Density								
Fixture	Quantity	Wattage	Total Wattage	SF	W/SF			
F1	18	41	738					
F2	5	29	145					
F3	4	29	116					
F4	6	33	198					
F5	4	62	248					
F6	2	118	236					
F7	4	32	128					
			1809	2145	0.84			

Using the input wattages for the specified ballast and lamps, the power density for the lobby is 0.84 W/SF. This is under the allowed 1.1 W/SF allowed for an open office.



Calculation Grids

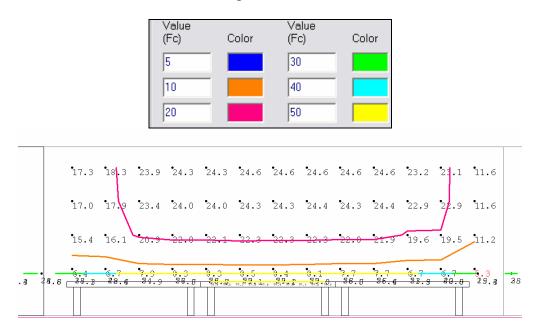


Numeric Summary						
Label	CalcType	Unit	s Avg	Max	Min	Avg/Min
Orange Wall	Illuminance	FC	17.86	24.6	5.3	3.37
Office_Desk	Illuminance	FC	52.89	57.4	45.4	1.16
Office_Cubicle	Illuminance	Fc	33.08	52.5	14.4	2.30
Private Office_Desk	Illuminance	FC	51.87	57.1	43.1	1.20
Workplane	Illuminance	Fс	16.07	59.2	2.4	6.70

The average illuminance of the work plane is 16 fc. This is an ideal level for the areas that are not work surfaces. The average to minimum fc ratio is 6.7. The office having slightly different levels of light in the space will make the space comfortable and add visual interest for the employees. Due to the task component of the task-ambient fixtures on each cubicle, the average cubicle illuminance is 33 fc, very evenly distributed with a 2.30 average to minimum fc ratio. The ambient component of the task-ambient fixtures used will illuminate the ceiling, to make the space feel energetic and not like a cave. The fixtures also eliminate direct and reflected glare because the source is mounted on each cubicle. Another advantage of the task-ambient fixtures is they are mounted to the cubicles, and therefore can move with the cubicle if the office is rearranged or more cubicles are added.



Orange Accent Wall



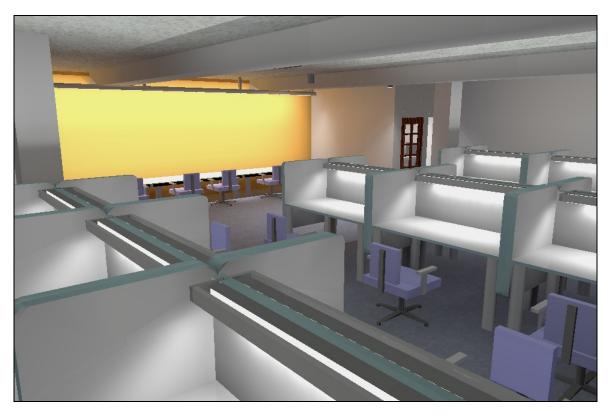
The orange accent wall has an average illuminance of 18 fc, with an average to minimum fc ratio of 3.37. The wall is evenly distributed, giving the office a spacious feel while highlighting the spectacular color of the wall.

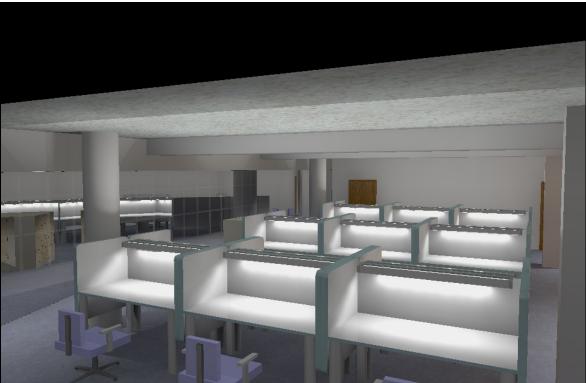
Control

The office suite will be standard switched control. Dimming of the design was unnecessary. The zones of fixtures are switched separately, giving the office suite some control. During most days the recessed downlights adjacent to the glass wall will not need to be on. The cylinders near the skylight will also not be needed on a number of days. All of the cubicle lights will be switched together. This is because if they are separately switched, the ambient component of light would be a very uneven distribution on the ceiling, having some lights on and some off. Also, after speaking with employees in the space office, they all agreed they would like a very bright environment. This environment will be an energetic space that leads to productivity.



Renderings







Conclusion

The office suite is a private space for the employees at the Woolly Mammoth Theatre. The workers spend long hours each week performing their duties in the space. Due to this, the lighting must be designed for comfort. The office should feel spacious and energetic, to encourage production in the space. All employees in the office suite use VDTs. The task-ambient light used in the design eliminates reflected and direct glare from the ceiling. This fixture also makes the design flexible with the movable cubicles. The task component provides the necessary illumination on the work surface, and the ambient component provides illumination on the ceiling to brighten the space. The wall washers accent the vibrant orange wall and give an energetic feel to the space. The office suite is controlled by standard switching, but zoned with the ability to switch areas off separately. The lighting design for the office is feasible, and



Electrical Depth

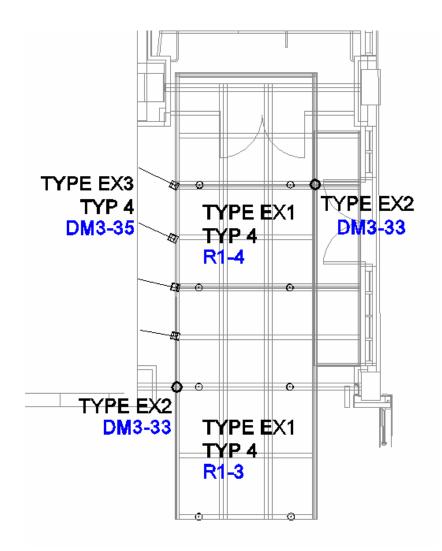
68



Electrical Depth

Electrical and Control Plans

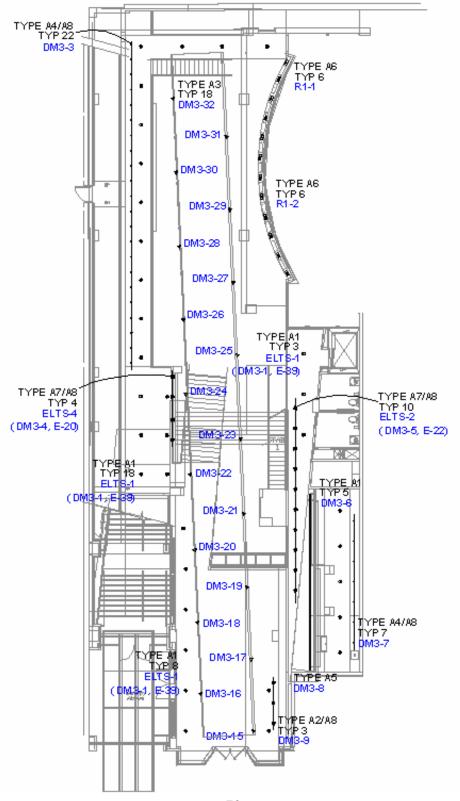
Canopy





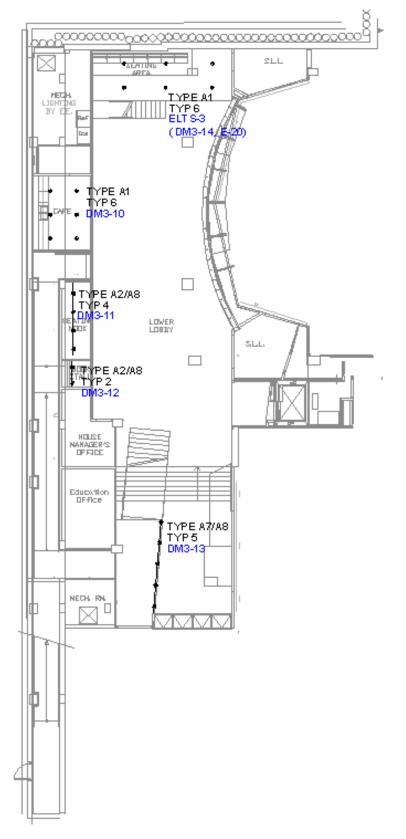
Lobby

Second Floor (Street Level) Plan



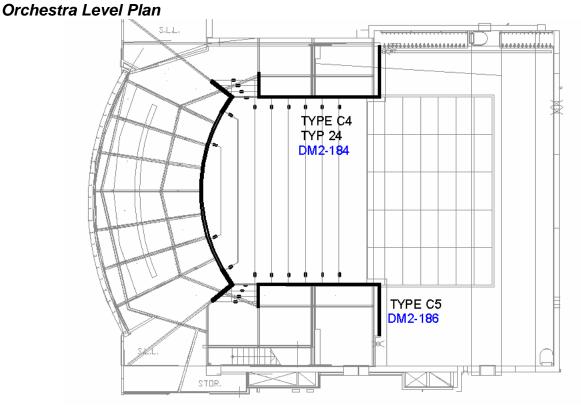


First Floor Plan





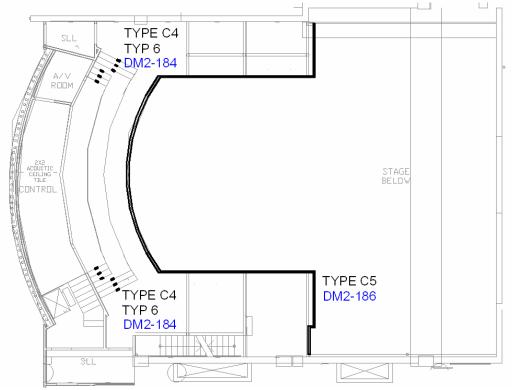
Theatre



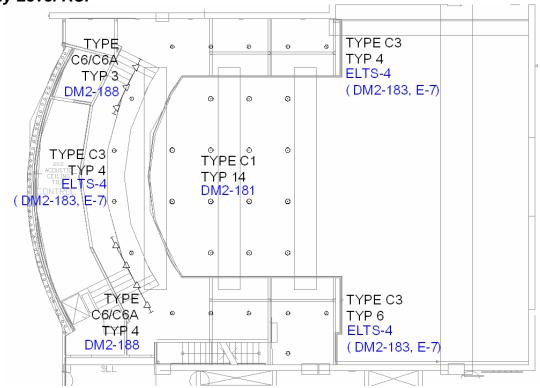
Orchestra Level RCP 0 ø 0 0 ø © ø ര ۲ c TYPE C2 o ∘ TYP 27 ELTS-2 ₀ (DM2-182, E-3) o ø ø ø ø ø 0 Θ φ TYPE C7/67A TYP 10 DM2-187 o ٥ ø ō Н \ge STOR,



Balcony Level Plan

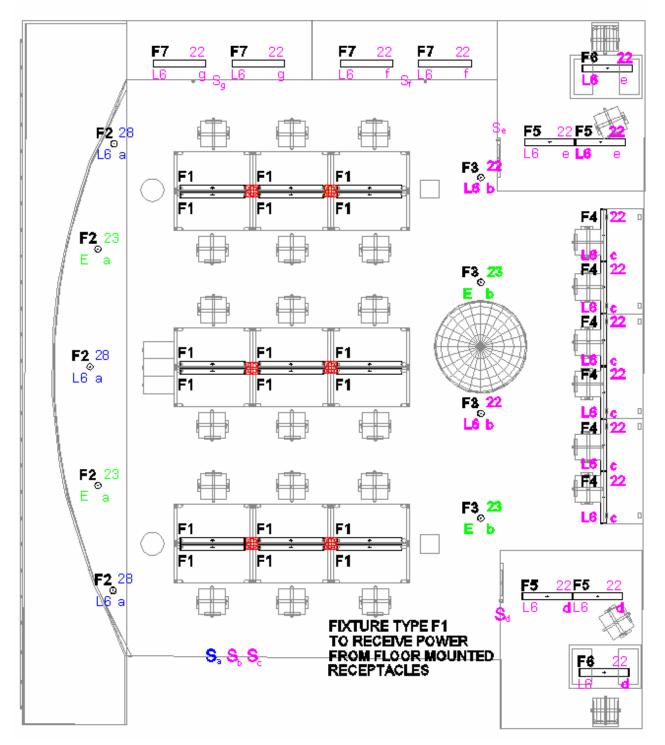


Balcony Level RCP





Office





Panelboards

Existing Panel M3

	PANELBOARD SCHEDULE											
SIZE/TYPE BUS:	VOLTAGE: 208Y/120V,3PH,4W TYPE BUS: 225A YPE MAIN: 225A/3P C/B			PANEL TAG: M3 PANEL LOCATION: xx PANEL MOUNTING: SURFACE						MIN. C/B AIC: OPTIONS:	85K	
DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	А	В	С	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
RECEPTACLE		160	20A/1P	1	*			2	20A/1P	1000		AHU-5
RECEPTACLE		320	20A/1P	3		*		4	20A/1P	1000		AHU-5
RECEPTACLE		320	20A/1P	5			*	6	20A/1P	1000		AHU-5
RECEPTACLE		160	20A/1P	7	*			8	20A/1P	1000		REFRIGERATOR
RECEPTACLE		160	20A/1P	9		*		10	20A/1P	400		ICEMAKER
RECEPTACLE		160	20A/1P	11			*	12	20A/1P	475		LIGHTS
RECEPTACLE		640	20A/1P	13	*			14	20A/1P	400		TRACK LIGHTS
RECEPTACLE		640	20A/1P	15		*		16	20A/1P	300		TRACK LIGHTS
RECEPTACLE		800	20A/1P	17			*	18	20A/1P	190		LIGHTS
RECEPTACLE		160	20A/1P	19	*			20	20A/1P	400		TRACK LIGHTS
DISPLAY LIGHTS		300	20A/1P	21		*		22	20A/1P	190		LIGHTS
RECEPTACLE		160	20A/1P	23			*	24	20A/1P	600		SUMP PUMP
RECEPTACLE		320	20A/1P	25	*			26	20A/1P	0		SPARE
RECEPTACLE		320	20A/1P	27		*		28	20A/1P	0		SPARE
RECEPTACLE		320	20A/1P	29			*	30	20A/1P	1000		BASEBOARD HEATER
RECEPTACLE		320	20A/1P	31	*			32	20A/1P	1000		BASEBOARD HEATER
SPARE		0	20A/1P	33		*		34	20A/1P	1000		BASEBOARD HEATER
SPARE		0	20A/1P	35			*	36	20A/1P	1000		BASEBOARD HEATER
SPARE		0	20A/1P	37	*			38	20A/1P	1000		BASEBOARD HEATER
SPARE		0	20A/1P	39		*		40	20A/1P	1000		BASEBOARD HEATER
SPARE		0	20A/1P	41			*	42	20A/1P	1000		BASEBOARD HEATER
CONNECTED LOAD	(KW) - A	6.56								TOTAL DESIGN I	OAD (KW)	20.96
CONNECTED LOAD	(KW) - B	5.63								POWER FACTOR	र	0.95
CONNECTED LOAD	(KW) - C	7.03								TOTAL DESIGN I	OAD (AMPS)	61

New Panel M3

		F	A N E	LBO	Α	R	D	SCH	IEDU	LE		
VOLTAGE: SIZE/TYPE BUS: SIZE/TYPE MAIN:		l,4W	PANEL TAG: M3 PANEL LOCATION: xx PANEL MOUNTING: SURFACE							MIN. C/B AIC: OPTIONS:	85K	
DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	А	В	С	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
RECEPTACLE		160	20A/1P	1	*			2	20A/1P	1000		AHU-5
RECEPTACLE		320	20A/1P	3		*		4	20A/1P	1000		AHU-5
RECEPTACLE		320	20A/1P	5			*	6	20A/1P	1000		AHU-5
RECEPTACLE		160	20A/1P	7	*			8	20A/1P	1000		REFRIGERATOR
RECEPTACLE		160	20A/1P	9		*		10	20A/1P	400		ICEMAKER
RECEPTACLE		160	20A/1P	11			*	12	20A/1P	0		SPARE
RECEPTACLE		640	20A/1P	13	*			14	20A/1P	0		SPARE
RECEPTACLE		640	20A/1P	15		*		16	20A/1P	0		SPARE
RECEPTACLE		800	20A/1P	17			*	18	20A/1P	0		SPARE
RECEPTACLE		160	20A/1P	19	*			20	20A/1P	400		TRACK LIGHTS
SPARE		0	20A/1P	21		*		22	20A/1P	190		LIGHTS
RECEPTACLE		160	20A/1P	23			*	24	20A/1P	600		SUMP PUMP
RECEPTACLE		320	20A/1P	25	*			26	20A/1P	0		SPARE
RECEPTACLE		320	20A/1P	27		*		28	20A/1P	0		SPARE
RECEPTACLE		320	20A/1P	29			*	30	20A/1P	1000		BASEBOARD HEATER
RECEPTACLE		320	20A/1P	31	*			32	20A/1P	1000		BASEBOARD HEATER
SPARE		0	20A/1P	33		*		34	20A/1P	1000		BASEBOARD HEATER
SPARE		0	20A/1P	35			*	36	20A/1P	1000		BASEBOARD HEATER
SPARE		0	20A/1P	37	*			38	20A/1P	1000		BASEBOARD HEATER
SPARE		0	20A/1P	39		*		40	20A/1P	1000		BASEBOARD HEATER
SPARE		0	20A/1P	41			*	42	20A/1P	1000		BASEBOARD HEATER
CONNECTED LOAD	(KW) - A	6.16								TOTAL DESIGN I	LOAD (KW)	19.23
CONNECTED LOAD	(KW) - B	5.03								POWER FACTOR	२	0.95
CONNECTED LOAD	(KW) - C	6.36								TOTAL DESIGN I	LOAD (AMPS)	56



Panel M3 Sizing

Note: All wires to be sized 75 degrees C, THWN, CU wire Design Load: 56 Amps Circuit Breaker Size: 60 Amps Feeder Size: #8 AWG Neutral: #8 AWG Ground: #10 AWG Conduit Size: 1 inch



Existing Panel L5

		Р	ΑΝΕ	LBO	AF	R [)	SCH	EDU	LE		
VOLTAGE: SIZE/TYPE BUS: SIZE/TYPE MAIN:		1,4W	PANEL TAG: L5 SECTION A PANEL LOCATION: xx PANEL MOUNTING: RECESSED							MIN. C/B AIC: 85K OPTIONS: DOUBLE SECTION PANEL WITH CABLE TIES BETWEEN MAIN LUGS		
DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	А	в	С	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
RECEPTACLE	0	800	20A/1P	1	*			2	20A/1P	1425	0	WH-1
RECEPTACLE	0	800	20A/1P	3		*		4	20A/1P	1425	0	WH-1
RECEPTACLE	0	320	20A/1P	5	*		*	6	20A/1P	1425	0	WH-1
RECEPTACLE RECEPTACLE	0	640 320	20A/1P 20A/1P	7		*		8 10	20A/1P 20A/1P	1300 320	0	LIFT RECEPTACLE
RECEPTACLE	0	320	20A/11 20A/1P	11		_	*	10	20A/1P	190	0	LIGHTS
RECEPTACLE	0	320	20A/1P	13	*			14	20A/1P	0	0	SPARE
RECEPTACLE	0	640	20A/1P	15		*		16	20A/1P	700	0	TRACK LIGHTS
RECEPTACLE	0	320	20A/1P	17			*	18	20A/1P	300	0	TRACK LIGHTS
RECEPTACLE	0	320	20A/1P	19	*			20	20A/1P	500	0	TRACK LIGHTS
RECEPTACLE	0	320	20A/1P	21		*	*	22	20A/1P	0	0	SPARE
RECEPTACLE RECEPTACLE	0	160 160	20A/1P 20A/1P	23 25	*			24 26	20A/1P 20A/1P	160	0	SPARE RECEPTACLE
RECEPTACLE	0	160	20A/1P 20A/1P	23		*		20	20A/1P 20A/1P	160	0	RECEPTACLE
RECEPTACLE	0	160	20A/1P	29			*	30	20A/1P	160	0	RECEPTACLE
RECEPTACLE	0	160	20A/1P	31	*			32	20A/1P	100	0	CARD READER
RECEPTACLE	0	800	20A/1P	33		*		34	20A/1P	100	0	PROCESSOR PANEL
REFRIGERATOR	0	800	20A/1P	35	*		*	36	20A/1P	0	0	SPARE
REFRIGERATOR RECEPTACLE	0	800 160	20A/1P 20A/1P	37 39	*	*		38 40	20A/1P 20A/1P	0	0	SPARE SPARE
COUNTER LIGHTS	0	190	20A/1P 20A/1P	41			*	40	20A/1P 20A/1P	0	0	SPARE
	÷	6.69	20/11						20/11	-	-	
CONNECTED LOAD	. ,									TOTAL DESIGN L	. ,	17.61
CONNECTED LOAD	(KW) - B	5.91								POWER FACTOR	8	0.90
CONNECTED LOAD	(KW) - C	4.35								TOTAL DESIGN L	_OAD (AMPS)	54
VOLTAGE: SIZE/TYPE BUS: SIZE/TYPE MAIN:		H,4W	PANEL TAG: L5 SECTION B PANEL LOCATION: xx PANEL MOUNTING: RECESSED								DOUBLE SECT	ION PANEL WITH
DESCRIPTION	LOCATION						UES	JOLD			CABLE TIES BE	TWEEN MAIN LUGS
TRACK UP	1000	LOAD (WATTS)	C/B SIZE	POS. NO.	А	в	CES C	POS. NO.	C/B SIZE		1	
TRACK UP		500	C/B SIZE 20A/1P	POS. NO. 43	A *		-	1	C/B SIZE 20A/1P		1	ETWEEN MAIN LUGS
TRACK UP	1000	500 500	20A/1P 20A/1P	43 45			-	POS. NO. 44 46	20A/1P 20A/1P	LOAD (WATTS) 1000 1000	LOCATION 1500 1500	DESCRIPTION PERF. LTS PERF. LTS
	400	500 500 500	20A/1P 20A/1P 20A/1P	43 45 47	*	В	-	POS. NO. 44 46 48	20A/1P 20A/1P 20A/1P	LOAD (WATTS) 1000 1000 500	LOCATION 1500 1500 1500	DESCRIPTION PERF. LTS PERF. LTS TRACK
TRACK DOWN	400 800	500 500 500 500	20A/1P 20A/1P 20A/1P 20A/1P	43 45 47 49		8 *	-	POS. NO. 44 46 48 50	20A/1P 20A/1P 20A/1P 20A/1P	LOAD (WATTS) 1000 1000 500 0	LOCATION 1500 1500 1500 1300	TWEEN MAIN LUGS DESCRIPTION PERF. LTS PERF. LTS TRACK LIGHT-WALL
TRACK DOWN TRACK DOWN	400 800 400	500 500 500 500 500 500	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	43 45 47 49 51	*	В	-	POS. NO. 44 46 48 50 52	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	LOAD (WATTS) 1000 1000 500 0 800	LOCATION 1500 1500 1500 1300 400	DESCRIPTION PERF. LTS PERF. LTS TRACK LIGHT-WALL LIGHT-WALL
TRACK DOWN	400 800	500 500 500 500	20A/1P 20A/1P 20A/1P 20A/1P	43 45 47 49	*	8 *	C *	POS. NO. 44 46 48 50	20A/1P 20A/1P 20A/1P 20A/1P	LOAD (WATTS) 1000 1000 500 0	LOCATION 1500 1500 1500 1300	TWEEN MAIN LUGS DESCRIPTION PERF. LTS PERF. LTS TRACK LIGHT-WALL
TRACK DOWN TRACK DOWN TRACK DOWN TRACK TRACK	400 800 400 400	500 500 500 500 500 500 500	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	43 45 47 49 51 53	*	8 *	C *	POS. NO. 44 46 48 50 52 52 54	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	LOAD (WATTS) 1000 1000 500 0 800 800	LOCATION 1500 1500 1500 1300 400	DESCRIPTION PERF. LTS PERF. LTS TRACK LIGHT-WALL LIGHT-WALL LIGHT-WALL
TRACK DOWN TRACK DOWN TRACK DOWN TRACK TRACK SPARE	400 800 400 400 400 800 400	500 500 500 500 500 500 500 800 800 0	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	43 45 47 49 51 53 55 57 59	*	8 * *	C *	POS. NO. 44 46 48 50 52 54 56 58 60	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	LOAD (WATTS) 1000 500 0 800 800 800 800 800 800	LOCATION 1500 1500 1300 400 200 700 300	TWEEN MAIN LUGS DESCRIPTION PERF. LTS PERF. LTS TRACK LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL
TRACK DOWN TRACK DOWN TRACK DOWN TRACK TRACK SPARE SPARE	400 800 400 400 800 400 0	500 500 500 500 500 500 800 800 0 0	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	43 45 47 49 51 53 55 57 59 61	*	8 * *	C *	POS. NO. 44 46 48 50 52 54 56 56 58 60 62	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	LOAD (WATTS) 1000 500 0 800 800 800 800 800 0 0	LOCATION 1500 1500 1300 400 200 700 300 0	DESCRIPTION PERF. LTS PERF. LTS TRACK LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL SPARE
TRACK DOWN TRACK DOWN TRACK DOWN TRACK TRACK SPARE SPARE SPARE	400 800 400 400 800 400 0 0	500 500 500 500 500 500 800 800 0 0 0 0	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	43 45 47 49 51 53 55 57 59 61 63	*	8 * *	C *	POS. NO. 44 46 50 52 54 56 58 60 62 64	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	LOAD (WATTS) 1000 500 0 800 800 800 800 800 800 0 0 0	LOCATION 1500 1500 1300 400 200 700 300 0 0	DESCRIPTION PERF. LTS PERF. LTS TRACK LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL SPARE SPARE
TRACK DOWN TRACK DOWN TRACK DOWN TRACK TRACK SPARE SPARE SPARE SPARE	400 800 400 400 800 400 0 0 0 0	500 500 500 500 500 500 800 800 800 0 0 0	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	43 45 47 51 53 55 57 59 61 63 65	*	8 * *	C *	POS. NO. 44 46 48 50 52 54 56 58 60 62 64 66	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	LOAD (WATTS) 1000 500 0 800 800 800 800 800 0 0 0 0 0 0	LOCATION 1500 1500 1300 400 200 700 300 0 0 0 0	TWEEN MAIN LUGS DESCRIPTION PERF. LTS PERF. LTS TRACK LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL SPARE SPARE SPARE
TRACK DOWN TRACK DOWN TRACK DOWN TRACK TRACK SPARE SPARE SPARE SPARE SPARE	400 800 400 400 800 400 0 0 0 0 0 0 0 0	500 500 500 500 500 500 800 800 0 0 0 0	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	43 45 47 49 51 53 55 57 59 61 63 65 67	*	8 * *	C *	POS. NO. 44 46 50 52 54 56 58 60 62 64 66 68	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	LOAD (WATTS) 1000 500 0 800 800 800 800 800 0 0 0 0 0	LOCATION 1500 1500 1300 400 200 700 300 0 0 0 0 0 0 0 0 0	TWEEN MAIN LUGS DESCRIPTION PERF. LTS PERF. LTS TRACK LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL SPARE SPARE SPARE SPARE
TRACK DOWN TRACK DOWN TRACK DOWN TRACK TRACK SPARE SPARE SPARE SPARE	400 800 400 400 800 400 0 0 0 0	500 500 500 500 500 500 800 800 800 0 0 0	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	43 45 47 51 53 55 57 57 61 63 65	*	8 * *	C *	POS. NO. 44 46 48 50 52 54 56 58 60 62 64 66	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	LOAD (WATTS) 1000 500 0 800 800 800 800 800 0 0 0 0 0 0	LOCATION 1500 1500 1300 400 200 700 300 0 0 0 0	TWEEN MAIN LUGS DESCRIPTION PERF. LTS PERF. LTS TRACK LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL SPARE SPARE SPARE
TRACK DOWN TRACK DOWN TRACK DOWN TRACK SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE	400 800 400 400 800 400 0 0 0 0 0 0 0 0	500 500 500 500 500 500 500 800 800 0 0 0	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	43 45 47 49 51 53 55 57 59 61 63 65 67 69	*	8 * *	C *	POS. NO. 44 46 50 52 54 56 56 56 60 62 64 66 66 68 70	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	LOAD (WATTS) 1000 500 0 800 800 800 800 800 0 0 0 0 0 0 0 0 0 0 0 0	LOCATION 1500 1500 1300 400 200 700 300 0 0 0 0 0 0 0 0 0 0 0 0	TWEEN MAIN LUGS DESCRIPTION PERF. LTS PERF. LTS TRACK LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL SPARE SPARE SPARE SPARE SPARE
TRACK DOWN TRACK DOWN TRACK DOWN TRACK SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE	400 800 400 400 800 400 0 0 0 0 0 0 0 0 0 0 0 0	500 500 500 500 500 500 500 500 0	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	43 45 47 49 51 53 55 57 59 61 63 65 67 67 69 71 73 75	*	8 * *	C * *	POS. NO. 44 46 48 50 52 54 56 58 60 62 64 64 66 68 70 72 74 76	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	LOAD (WATTS) 1000 500 0 800 800 800 800 800 0 0 0 0 0	LOCATION 1500 1500 1300 400 200 700 300 0 0 0 0 0 0 0 0 0 0 0 0	TWEEN MAIN LUGS DESCRIPTION PERF. LTS PERF. LTS TRACK LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE
TRACK DOWN TRACK DOWN TRACK DOWN TRACK SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE	400 800 400 400 800 0 0 0 0 0 0 0 0 0 0 0 0	500 500 500 500 500 500 500 500 600 0	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77	*	B * *	C *	POS. NO. 44 46 50 52 54 56 58 60 62 64 66 68 70 72 72 74 76 78	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	LOAD (WATTS) 1000 1000 500 0 800 800 800 800 800 0 0 0 0 0 0 0 0 0 0 0 0	LOCATION 1500 1500 1500 200 200 700 300 0 0 0 0 0 0 0 0 0 0 0 0	TWEEN MAIN LUGS DESCRIPTION PERF. LTS PERF. LTS TRACK LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL SPARE
TRACK DOWN TRACK DOWN TRACK DOWN TRACK SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE	400 800 400 400 800 0 0 0 0 0 0 0 0 0 0 0 0	500 500 500 500 500 500 500 500 500 600 0	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79	*	B * * *	C * * *	POS. NO. 44 46 50 52 54 56 60 62 64 66 68 70 72 74 74 76 78 80	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	LOAD (WATTS) 1000 500 0 800 800 800 800 0 0 0 0 0 0 0 0 0 0 0 0	LOCATION 1500 1500 1500 200 200 700 300 0 0 0 0 0 0 0 0 0 0 0 0	TWEEN MAIN LUGS DESCRIPTION PERF. LTS PERF. LTS TRACK LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE
TRACK DOWN TRACK DOWN TRACK DOWN TRACK SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE	400 800 400 400 800 0 0 0 0 0 0 0 0 0 0 0 0	500 500 500 500 500 500 500 500 600 0	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 81	*	B * *	C * * *	POS. NO. 44 46 48 50 52 54 56 58 60 62 64 64 66 66 66 66 68 70 72 72 74 76 78 80 82	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	LOAD (WATTS) 1000 500 0 800 800 800 800 800 0 0 0 0 0 0 0 0 0 0 0 0	LOCATION 1500 1500 1300 400 200 700 300 0 0 0 0 0 0 0 0 0 0 0 0	TWEEN MAIN LUGS DESCRIPTION PERF. LTS PERF. LTS TRACK LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL SPARE
TRACK DOWN TRACK DOWN TRACK DOWN TRACK SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE	400 800 400 400 800 0 0 0 0 0 0 0 0 0 0 0 0	500 500 500 500 500 500 500 500 500 600 0	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79	*	B * * *	C * * *	POS. NO. 44 46 50 52 54 56 60 62 64 66 68 70 72 74 74 76 78 80	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	LOAD (WATTS) 1000 500 0 800 800 800 800 0 0 0 0 0 0 0 0 0 0 0 0	LOCATION 1500 1500 1500 200 200 0 0 0 0 0 0 0 0 0 0 0 0	TWEEN MAIN LUGS DESCRIPTION PERF. LTS PERF. LTS TRACK LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE
TRACK DOWN TRACK DOWN TRACK DOWN TRACK SPARE SPA	400 800 400 400 0 0 0 0 0 0 0 0 0 0 0 0	500 500 500 500 500 500 500 500 500 500 500 500 500 60 0	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 81	*	B * * *	C * * *	POS. NO. 44 46 48 50 52 54 56 58 60 62 64 64 66 66 66 66 68 70 72 72 74 76 78 80 82	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	LOAD (WATTS) 1000 500 0 800 800 800 800 0 0 0 0 0 0 0 0 0 0 0 0	LOCATION 1500 1500 1300 400 200 0 0 0 0 0 0 0 0 0 0 0 0	TWEEN MAIN LUGS DESCRIPTION PERF. LTS PERF. LTS TRACK LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL SPARE
TRACK DOWN TRACK DOWN TRACK DOWN TRACK SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE	400 800 400 400 0 0 0 0 0 0 0 0 0 0 0 0	500 500 500 500 500 500 500 500 0	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 81	*	B * * *	C * * *	POS. NO. 44 46 48 50 52 54 56 58 60 62 64 64 66 66 66 66 68 70 72 72 74 76 78 80 82	20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P 20A/1P	LOAD (WATTS) 1000 500 0 800 800 800 800 0 0 0 0 0 0 0 0 0 0 0 0	LOCATION 1500 1500 1500 200 200 0 0 0 0 0 0 0 0 0 0 0 0	TWEEN MAIN LUGS DESCRIPTION PERF. LTS PERF. LTS TRACK LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL LIGHT-WALL SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE



New Panel L5

	PANELBOARD SCHEDULE											
SIZE/TYPE BUS:	VOLTAGE: 208Y/120V,3PH,4W SIZE/TYPE BUS: 225A IZE/TYPE MAIN: 225A/3P C/B			PANEL T NEL LOCATI IEL MOUNTI	ON:	xx				MIN. C/B AIC: OPTIONS:	85K	
DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	Α	В	С	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
RECEPTACLE	0	800	20A/1P	1	*			2	20A/1P	1425	0	WH-1
RECEPTACLE	0	800	20A/1P	3		*		4	20A/1P	1425	0	WH-1
RECEPTACLE	0	320	20A/1P	5			*	6	20A/1P	1425	0	WH-1
RECEPTACLE	0	640	20A/1P	7	*			8	20A/1P	1300	0	LIFT
RECEPTACLE	0	320	20A/1P	9		*		10	20A/1P	320	0	RECEPTACLE
RECEPTACLE	0	320	20A/1P	11			*	12	20A/1P	1000	0	PERF. LTS
RECEPTACLE	0	320	20A/1P	13	*			14	20A/1P	0	0	SPARE
RECEPTACLE	0	640	20A/1P	15		*		16	20A/1P	1000	0	PERF. LTS
RECEPTACLE	0	320	20A/1P	17			*	18	20A/1P	300	0	LIGHTWALL
RECEPTACLE	0	320	20A/1P	19	*			20	20A/1P	300	0	LIGHTWALL
RECEPTACLE	0	320	20A/1P	21		*		22	20A/1P	140	0	CANOPY
RECEPTACLE	0	160	20A/1P	23			*	24	20A/1P	140	0	CANOPY
RECEPTACLE	0	160	20A/1P	25	*			26	20A/1P	160	0	RECEPTACLE
RECEPTACLE	0	160	20A/1P	27		*		28	20A/1P	160	0	RECEPTACLE
RECEPTACLE	0	160	20A/1P	29			*	30	20A/1P	160	0	RECEPTACLE
RECEPTACLE	0	160	20A/1P	31	*			32	20A/1P	100	0	CARD READER
RECEPTACLE	0	800	20A/1P	33		*		34	20A/1P	100	0	PROCESSOR PANEL
REFRIGERATOR	0	800	20A/1P	35			*	36	20A/1P	0	0	SPARE
REFRIGERATOR	0	800	20A/1P	37	*			38	20A/1P	2978	0	DIM 3
RECEPTACLE	0	160	20A/1P	39		*		40	20A/1P	2977	0	DIM 3
COUNTER LIGHTS	0	190	20A/1P	41			*	42	20A/1P	2977	0	DIM 3
CONNECTED LOAD	(KW) - A	9.46								TOTAL DESIGN	LOAD (KW)	29.76
CONNECTED LOAD	(KW) - B	9.32								POWER FACTO	R	0.94
CONNECTED LOAD	(KW) - C	8.27								TOTAL DESIGN	LOAD (AMPS)	88

All loads were removed from Panel L5 Section B. Therefore it was removed from the system.

	PANELBOARD SCHEDULE											
VOLTAGE: SIZE/TYPE BUS: SIZE/TYPE MAIN:		I,4W		PANEL T NEL LOCATI IEL MOUNTI	ON:	хх					DOUBLE SECTION	ON PANEL WITH IWEEN MAIN LUGS
DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	А	В	С	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
SPARE	0	0	20A/1P	43	*			44	20A/1P	0	0	SPARE
SPARE	0	0	20A/1P	45		*		46	20A/1P	0	0	SPARE
SPARE	0	0	20A/1P	47			*	48	20A/1P	0	0	SPARE
SPARE	0	0	20A/1P	49	*			50	20A/1P	0	0	SPARE
SPARE	0	0	20A/1P	51		*		52	20A/1P	0	0	SPARE
SPARE	0	0	20A/1P	53			*	54	20A/1P	0	0	SPARE
SPARE	0	0	20A/1P	55	*			56	20A/1P	0	0	SPARE
SPARE	0	0	20A/1P	57		*		58	20A/1P	0	0	SPARE
SPARE	0	0	20A/1P	59			*	60	20A/1P	0	0	SPARE
SPARE	0	0	20A/1P	61	*			62	20A/1P	0	0	SPARE
SPARE	0	0	20A/1P	63		*		64	20A/1P	0	0	SPARE
SPARE	0	0	20A/1P	65			*	66	20A/1P	0	0	SPARE
SPARE	0	0	20A/1P	67	*			68	20A/1P	0	0	SPARE
SPARE	0	0	20A/1P	69		*		70	20A/1P	0	0	SPARE
SPARE	0	0	20A/1P	71			*	72	20A/1P	0	0	SPARE
SPARE	0	0	20A/1P	73	*			74	20A/1P	0	0	SPARE
SPARE	0	0	20A/1P	75		*		76	20A/1P	0	0	SPARE
SPARE	0	0	20A/1P	77			*	78	20A/1P	0	0	SPARE
SPARE	0	0	20A/1P	79	*			80	20A/1P	0	0	SPARE
SPARE	0	0	20A/1P	81		*	L	82	20A/1P	0	0	SPARE
SPARE	0	0	20A/1P	83			*	84	20A/1P	0	0	SPARE
CONNECTED LOAD	(KW) - A	0.00								TOTAL DESIGN	LOAD (KW)	0.00
CONNECTED LOAD	. ,	0.00								POWER FACTO	R	
CONNECTED LOAD	(KW) - C	0.00								TOTAL DESIGN	LOAD (AMPS)	0



Panel L5 Sizing

Note: All wires to be sized 75 degrees C, THWN, CU wire Design Load: 88 Amps Circuit Breaker Size: 90 Amps Feeder Size: #4 AWG Neutral: #4 AWG Ground: #8 AWG Conduit Size: (4) #4 AWG, (1) #8 AWG (4) * 0.0824 + 0.0366 = 0.03662 inches squared 40% * 1.526" = 0.614" > 0.03662" Conduit to be 1 ¼" RMC



Emergency Lighting Transfer Switch Panel

I	EMERGENCY LIGHTING TRANSFER SWITCH (ELTS) PANEL - LOBBY						
20 A	20 AMP RATED, 4-WIRE INPUT, 2-POLE TRANSFER,						
	2-WIRE OUTPUT						
ALT #	ALT # NORMAL/RELAY/DIMMING CKT EMERGENC CKT						
1	DM3-1	E-39					
2	DM3-5	E-22					
3	3 DM3-14 E-37						
4	DM3-4	E-20					
5	SPARE						
6	SPARE						
7	SPARE						
8	SPARE						
9	SPARE						
10	SPARE						
11	SPARE						
12	SPARE						



New Panel DM3

			LOBBY/CANOPY DIMMER SCHEDU DM3 SCHEDULE	LE		
ZONE. NO	CKT NO.	FIXTURE TYPE	DESCRIPTION	WATTS/ FIXTURE	QTY.	LOAD (W)
1	1	A1	CFL PENDANTS	39	29	1,131
2	2		SPARE			
3	3	A4	TRACK- CATWALK	50	22	1,100
4	4	A7	TRACK- MAIN STAIRS	100	4	400
5	5	A7	TRACK- MAIN STAIRS	100	10	1,000
6	6	A1	CFL PENDANTS- TICKET BOOTH	39	5	195
7	7	A4	TRACK- TICKET BOOTH	50	7	350
8	8	A5	LED STRIP- TICKET BOOTH	1	230	230
9	9	A2	TRACK- ENTRANCE WALL	50	3	150
10	10	A1	CFL PENDANTS- CAFÉ	39	6	234
11	11	A2	TRACK- SEATING NOOK	50	4	200
12	12	A2	TRACK- BOOK STALL	50	2	100
13	13	A7	TRACK- UNDER MAIN STAIRS	100	5	500
14	14	A1	CFL PENDANTS- SEATING AREA	39	6	234
15	15	A3	ACCENT- GYPSUM PANEL	71	1	71
16	16	A3	ACCENT- GYPSUM PANEL	71	1	71
17	17	A3	ACCENT- GYPSUM PANEL	71	1	71
18	18	A3	ACCENT- GYPSUM PANEL	71	1	71
19	19	A3	ACCENT- GYPSUM PANEL	71	1	71
20	20	A3	ACCENT- GYPSUM PANEL	71	1	71
21	21	A3	ACCENT- GYPSUM PANEL	71	1	71
22	22	A3	ACCENT- GYPSUM PANEL	71	1	71
23	23	A3	ACCENT- GYPSUM PANEL	71	1	71
24	24	A3	ACCENT- GYPSUM PANEL	71	1	71
25	25	A3	ACCENT- GYPSUM PANEL	71	1	71
26	26	A3	ACCENT- GYPSUM PANEL	71	1	71
27	27	A3	ACCENT- GYPSUM PANEL	71	1	71
28	28	A3	ACCENT- GYPSUM PANEL	71	1	71
29	29	A3	ACCENT- GYPSUM PANEL	71	1	71
30	30	A3	ACCENT- GYPSUM PANEL	71	1	71
31	31	A3	ACCENT- GYPSUM PANEL	71	1	71
32	32	A3	ACCENT- GYPSUM PANEL	71	1	71
33	33	EX2	SOURCE 4 JR- CANOPY	375	2	750



34	34		SPARE			
35	35	EX3	CYLINDER ACCENT- CANOPY	50	4	200
36			SPARE			
37			SPARE			
38			SPARE			
39			SPARE			
40			SPARE			
41			SPARE			
42			SPARE			
43			SPARE			
44			SPARE			
45			SPARE			
46			SPARE			
47			SPARE			
48			SPARE			
	•	· · · · ·		TOTAL LO	DAD (W)	8,052

Panel DM3 Sizing

Note: All wires to be sized 75 degrees C, THWN, CU wire Design Load: 23 Amps Circuit Breaker Size: 30 Amps Feeder Size: #10 AWG Neutral: #10 AWG Ground: #10 AWG Conduit Size: ¾ "



New Relay R1

	REL	AY R1 PANEL SCHEDULE	
ATS #	AMPACITY	ZONE (DMX 512 CONTROL)	FROM CKT
1	20 A	LIGHTWALL	L5-18
2	20 A	LIGHTWALL	L5-20
3	20 A	CANOPY	L5-22
4	20 A	CANOPY	L5-24
5	20 A	SPARE	
6	20 A	SPARE	
7	20 A	SPARE	
8	20 A	SPARE	
9	20 A	SPARE	
10	20 A	SPARE	
11	20 A	SPARE	
12	20 A	SPARE	
13	20 A	SPARE	
14	20 A	SPARE	
15	20 A	SPARE	
16	20 A	SPARE	
17	20 A	SPARE	
18	20 A	SPARE	
19	20 A	SPARE	
20	20 A	SPARE	
21	20 A	SPARE	
22	20 A	SPARE	
23	20 A	SPARE	
24	20 A	SPARE	



Existing Emergency Lighting Transfer Switch Panel

	EMERGENCY LIGHTING TRANSFER SWITCH (ELTS) PANEL- THEATRE						
20	AMP RATED, 4-WIRE INPUT, 2-POI	LE TRANSFER,					
	2-WIRE OUTPUT						
ALT #	NORMAL/RELAY/DIMMING CKT	EMERGENCY CKT					
1	SPARE	SPARE					
2	DM2-183	E-3					
3	DM2-184	E-5					
4	DM2-185	E-7					
5	SPARE	SPARE					
6	T1-2	E-11					
7	T1-6	E-13					
8	R-13	E-19					
9	R-12	E-21					
10	R-16	E-27					
11	T1-14	E-24					
12	SPARE	SPARE					
13	SPARE	SPARE					
14	SPARE	SPARE					
15	SPARE	SPARE					
16	SPARE	SPARE					
17	SPARE	SPARE					
18	SPARE	SPARE					
19	SPARE						
20	SPARE						
21	SPARE						
22	SPARE						
23	SPARE						
24	SPARE						
25	SPARE						



New Emergency Lighting Transfer Switch Panel

	EMERGENCY LIGHTING TRA SWITCH (ELTS) PANEL-THE							
20	20 AMP RATED, 4-WIRE INPUT, 2-POLE TRANSFER,							
	2-WIRE OUTPUT							
ALT #	NORMAL/RELAY/DIMMING CKT	EMERGENCY CKT						
1	SPARE	SPARE						
2	DM2-182	E-3						
3	DM2-184	E-5						
4	DM2-183	E-7						
5	SPARE	SPARE						
6	T1-2	E-11						
7	T1-6	E-13						
8	R-13	E-19						
9	R-12	E-21						
10	R-16	E-27						
11	T1-14	E-24						
12	SPARE	SPARE						
13	SPARE	SPARE						
14	SPARE	SPARE						
15	SPARE	SPARE						
16	SPARE	SPARE						
17	SPARE	SPARE						
18	SPARE	SPARE						
19	SPARE							
20	SPARE							
21	SPARE							
22	SPARE							
23	SPARE							
24	SPARE							
25	SPARE							



Existing Panel DM2

	THEATER DIMMER PANEL DM2 SCHEDULE						
DIMMER #	DIMMING MODULE	ZONE (512 CONTROL)					
181	2.4 KW	BACK WALL 1ST FLR. LIGHTS					
182	2.4 KW	BACK WALL 1ST FLR. LIGHTS					
183	2.4 KW	UNDER BALCONY 1ST FLR LIGHTS					
184	2.4 KW	SLL AND STAIR LIGHTS					
185	2.4 KW	2ND FLR LIGHTS					
186	2.4 KW	BACK WALL 2ND FLR. LIGHTS					
187	2.4 KW	HOUSE LIGHTS					
188	2.4 KW	HOUSE LIGHTS					

New Panel Dim2

	THEATER DIMMER PANEL DM2 SCHEDULE										
ZONE. NO	FIXTURE TYPE	DESCRIPTION	WATTS/ FIXTURE	QTY.	LOAD (W)						
181	C1	CFL PENDANTS	148	7	1,036						
181	C1	CFL PENDANTS	148	7	1,036						
182	C2	CFL CYLINDERS- FIRST FLOOR	39	27	1,053						
183	C3	CFL PENDANT CYLINDERS- BALCONY FLOOR	50	15	750						
184	B, B1, B2	SLL AND STAIR LIGHTS			650						
185	C4	STEPLIGHTS	20	24	480						
186	C5	LED RAILING	2	240	480						
187	C7	TRACK- BACK WALL 1ST FLR.	50	10	500						
188	C6	SUSPENDED TRACK- BACK WALL 2ND FLR.	120	7	840						

Feeders for Panel DM2 could not be sized due to the unknown loads of Zone No. 1 - 180.



Existing Panel L6

		Р	ANE	LBO	AF	r D)	SCH	EDU	LE		
VOLTAGE: 208Y/120V,3PH,4W SIZE/TYPE BUS: 225A SIZE/TYPE MAIN: 225A/3P C/B			PANEL TAG: L6 PANEL LOCATION: SECOND LEVEL PANEL MOUNTING: SURFACE							MIN. C/B AIC: 85K OPTIONS:		
DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	А	в	С	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
SYSTEMS FURN		800	20A/1P	1	*			2	20A/1P	320		RECEPTACLE
SYSTEMS FURN		800	20A/1P	3		*		4	20A/1P	320		RECEPTACLE
SYSTEMS FURN		800	20A/1P	5			*	6	20A/1P	320		RECEPTACLE
SYSTEMS FURN		800	20A/1P	7	*			8	20A/1P	320		RECEPTACLE
SYSTEMS FURN		800	20A/1P	9		*		10	20A/1P	320		RECEPTACLE
SYSTEMS FURN		800	20A/1P	11			*	12	20A/1P	320		RECEPTACLE
SYSTEMS FURN		800	20A/1P	13	*			14	20A/1P	0		SPARE
SYSTEMS FURN		800	20A/1P	15		*		16	20A/1P	0		SPARE
SYSTEMS FURN		800	20A/1P	17			*	18	20A/1P	0		SPARE
RECEPTACLE		160	20A/1P	19	*			20	20A/1P	400		DISPOSAL
RECEPTACLE		160	20A/1P	21		*		22	20A/1P	1520		LIGHTS
RECEPTACLE		160	20A/1P	23			*	24	20A/1P	1520		LIGHTS
RECEPTACLE		160	20A/1P	25	*			26	20A/1P	760		LIGHTS
RECEPTACLE		160	20A/1P	27		*		28	20A/1P	0		SPARE
RECEPTACLE		960	20A/1P	29			*	30	20A/1P	1100		TRACK LIGHTS
RECEPTACLE		800	20A/1P	31	*			32	20A/1P	320		RECEPTACLE
RECEPTACLE		320	20A/1P	33		*		34	20A/1P	320		RECEPTACLE
RECEPTACLE		800	20A/1P	35			*	36	20A/1P	100		CHAIR LIFT
RECEPTACLE		960	20A/1P	37	*			38	20A/1P	100		CARD READER
RECEPTACLE		800	20A/1P	39		*		40	20A/1P	400		F-5
RECEPTACLE		320	20A/1P	41			*	42	20A/1P	0		SPARE
CONNECTED LOAD	(KW) - A	6.70								TOTAL DESIGN	LOAD (KW)	22.71
CONNECTED LOAD	. ,	6.72								POWER FACTO	R	0.92
CONNECTED LOAD	(KW) - C	8.00								TOTAL DESIGN	LOAD (AMPS)	69

New Panel L6

		Р	ANE	LBO	Α	R	D	SCH	EDU	LE		
VOLTAGE: 208Y/120V,3PH,4W SIZE/TYPE BUS: 225A SIZE/TYPE MAIN: 225A/3P C/B			PANEL TAG: L6 PANEL LOCATION: SECOND FLOOR PANEL MOUNTING: SURFACE							MIN. C/B AIC: 85K OPTIONS:		
DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	А	В	С	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
SYSTEMS FURN		800	20A/1P	1	*			2	20A/1P	320		RECEPTACLE
SYSTEMS FURN		800	20A/1P	3		*		4	20A/1P	320		RECEPTACLE
SYSTEMS FURN		800	20A/1P	5			*	6	20A/1P	320		RECEPTACLE
SYSTEMS FURN		800	20A/1P	7	*			8	20A/1P	320		RECEPTACLE
SYSTEMS FURN		800	20A/1P	9		*		10	20A/1P	320		RECEPTACLE
SYSTEMS FURN		800	20A/1P	11			*	12	20A/1P	320		RECEPTACLE
SYSTEMS FURN		800	20A/1P	13	*			14	20A/1P	864	OFFICE	QUAD RECEPTACLE
SYSTEMS FURN		800	20A/1P	15		*		16	20A/1P	864	OFFICE	QUAD RECEPTACLE
SYSTEMS FURN		800	20A/1P	17			*	18	20A/1P	0		SPARE
RECEPTACLE		160	20A/1P	19	*			20	20A/1P	400		DISPOSABLE
RECEPTACLE		160	20A/1P	21		*		22	20A/1P	926	OFFICE	OFFICE LIGHTS
RECEPTACLE		160	20A/1P	23			*	24	20A/1P	1520		LIGHTS
RECEPTACLE		160	20A/1P	25	*			26	20A/1P	760		LIGHTS
RECEPTACLE		160	20A/1P	27		*		28	20A/1P	664	OFFICE	OFFICE LIGHTS
RECEPTACLE		960	20A/1P	29			*	30	20A/1P	1100		TRACK LIGHTS
RECEPTACLE		800	20A/1P	31	*			32	20A/1P	320		RECEPTACLE
RECEPTACLE		320	20A/1P	33		*		34	20A/1P	320		RECEPTACLE
RECEPTACLE		800	20A/1P	35			*	36	20A/1P	100		CHAIR LIFT
RECEPTACLE		960	20A/1P	37	*			38	20A/1P	100		CARD READER
RECEPTACLE		800	20A/1P	39		*		40	20A/1P	400		F-5
RECEPTACLE		320	20A/1P	41			*	42	20A/1P	0		QUAD RECEPTACLE
CONNECTED LOAD	(KW) - A	7.56								TOTAL DESIGN	LOAD (KW)	23.76
CONNECTED LOAD	(KW) - B	7.65								POWER FACTOR		0.9
CONNECTED LOAD	(KW) - C	8.00								TOTAL DESIGN	LOAD (AMPS)	73



Panel L6 Sizing

Note: All wires to be sized 75 degrees C, THWN, CU wire Design Load: 73 Amps Circuit Breaker Size: 80 Amps Feeder Size: #6 AWG Neutral: #6 AWG Ground: #8 AWG Conduit Size: 1 ¼"

Emergency Lighting Panelboards

Existing Panel E

	PANELBOARD SCHEDULE											
VOLTAGE: 208Y/120V,3PH,4W SIZE/TYPE BUS: 225A SIZE/TYPE MAIN: 225A/3P C/B			PANEL TAG: E PANEL LOCATION: SHOP PANEL MOUNTING: SURFACE							MIN. C/B AIC: MATCHING EXISTING ATS OPTIONS:		
DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	А	В	С	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
FACP		200	20A/1P	1	*			2	20A/1P	200		ELEV TROUGH
THEATER LIGHTS		300	20A/1P	3		*		4	20A/1P	1000		ELEV PIT
THEATER LIGHTS		1900	20A/1P	5			*	6	20A/1P	200		EXIT SIGNS
THEATER LIGHTS		1900	20A/1P	7	*			8	20A/1P	100		LIGHT
SPARE		0	20A/1P	9		*		10	20A/1P	200		EXIST SIGNS
ONTROL RM LIGHT		500	20A/1P	11			*	12	20A/1P	200		EXIT SIGNS
LIGHTS		300	20A/1P	13	*			14	20A/1P	200		FREIGHT ELEV TROUGH
LIGHTS		900	20A/1P	15		*		16	20A/1P	100		FREIGHT ELEV LIGHT
LIGHTS-1ST FL		600	20A/1P	17			*	18	20A/1P	1000		FREIGHT ELEV PIT
THEATER LIGHTS		300	20A/1P	19	*			20	20A/1P	400		TRACK LIGHTS
THEATER LIGHTS		200	20A/1P	21		*		22	20A/1P	1000		TRACK LIGHTS
LIGHTS OFFICE		500	20A/1P	23			*	24	20A/1P	0		STEP LIGHTS
LIGHTS OFFICE		300	20A/1P	25	*			26	20A/1P	0		SPARE
LIGHTS SLL		300	20A/1P	27		*		28	20A/1P	0		SPARE
LIGHTS CORR		1200	20A/1P	29			*	30	20A/1P	0		SPARE
LIGHTS CORR		1200	20A/1P	31	*			32	20A/1P	0		SPARE
LIGHTS-1ST FL		1500	20A/1P	33		*		34	20A/1P	0		SPARE
LIGHTS CORR		300	20A/1P	35			*	36	20A/1P	0		SPARE
LIGHTS-1ST FL		1300	20A/1P	37	*			38	20A/1P	4000		SPACE
LIGHTS-2ND FL		500	20A/1P	39		*		40	20A/1P	4000		SPACE
LIGHTS TRACK		700	20A/1P	41			*	42	20A/1P	4000		SPACE
CONNECTED LOAD	(KW) - A	10.40								TOTAL DESIGN	LOAD (KW)	18.74
CONNECTED LOAD	(KW) - B	10.00								POWER FACTO	R	1.00
CONNECTED LOAD	(KW) - C	11.10								TOTAL DESIGN	LOAD (AMPS)	52



New Panel E

	PANELBOARD SCHEDULE											
VOLTAGE: 208Y/120V,3PH,4W SIZE/TYPE BUS: 225A SIZE/TYPE MAIN: 225A/3P C/B			PANEL TAG: E PANEL LOCATION: SHOP PANEL MOUNTING: SURFACE							MIN. C/B AIC: MATCHING EXISTING ATS OPTIONS:		
DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	А	В	С	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
FACP		200	20A/1P	1	*			2	20A/1P	200		ELEV TROUGH
THEATER LIGHTS		300	20A/1P	3		*		4	20A/1P	1000		ELEV PIT
THEATER LIGHTS		1900	20A/1P	5			*	6	20A/1P	200		EXIT SIGNS
THEATER LIGHTS		1900	20A/1P	7	*			8	20A/1P	100		LIGHT
SPARE		0	20A/1P	9		*		10	20A/1P	200		EXIT SIGNS
CONTROL RM LIGHTS		500	20A/1P	11			*	12	20A/1P	200		EXIT SIGNS
LIGHTS		300	20A/1P	13	*			14	20A/1P	200		FREIGHT ELEV TROUGH
SPARE		0	20A/1P	15		*		16	20A/1P	100		FREIGHT ELEV LIGHT
LIGHTS-1ST FL		600	20A/1P	17			*	18	20A/1P	1000		FREIGHT ELEV PIT
THEATER LIGHTS		300	20A/1P	19	*			20	20A/1P	400		TRACK LIGHTS
THEATER LIGHTS		200	20A/1P	21		*		22	20A/1P	1000		TRACK LIGHTS
LIGHTS OFFICE		205	20A/1P	23			*	24	20A/1P	0		SPARE
LIGHTS OFFICE		300	20A/1P	25	*			26	20A/1P	0		SPARE
LIGHTS SLL		300	20A/1P	27		*		28	20A/1P	0		SPARE
LIGHTS CORR		1200	20A/1P	29			*	30	20A/1P	0		SPARE
LIGHTS CORR		1200	20A/1P	31	*			32	20A/1P	0		SPARE
LIGHTS-1ST FL		1500	20A/1P	33		*		34	20A/1P	0		SPARE
LIGHTS CORR		300	20A/1P	35			*	36	20A/1P	0		SPARE
LIGHTS-1ST FL		234	20A/1P	37	*			38	20A/1P	4000		SPACE
LIGHTS-2ND FL		1131	20A/1P	39		*		40	20A/1P	4000		SPACE
LIGHTS TRACK		700	20A/1P	41			*	42	20A/1P	4000		SPACE
CONNECTED LOAD (KW	/) - A	9.33								TOTAL DESIGN	LOAD (KW)	10.93
CONNECTED LOAD (KW	/) - B	9.73								POWER FACTO		1.00
CONNECTED LOAD (KW	/) - C	10.81								TOTAL DESIGN	LOAD (AMPS)	30

Panel E Sizing

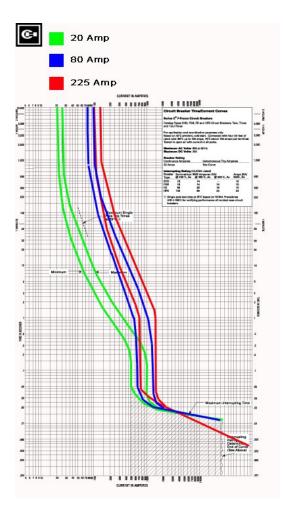
Note: All wires to be sized 75 degrees C, THWN, CU wire Design Load: 30 Amps Circuit Breaker Size: 30 Amps Feeder Size: #10 AWG Neutral: #10 AWG Ground: #10 AWG Conduit Size: ¾"

Note: Voltage drop calculations did not need to be calculated for new design panels. All panels are located in electrical closets in the corresponding rooms. Therefore the distance of the runs was not long.



Device Coordination Study

All circuit breaker cut-sheets can be found in Appendix B-1



Conclusion

This diagram above shows three devices from the electrical system, a 20 A circuit breaker from a branch circuit and the 80 A circuit breaker from panel L6 and a 225 A circuit breaker from switchboard S1. The three devices are coordinated because the 20 A breaker will trip before the 80 A breaker, and the 80 A breaker will trip before the 225 A breaker.

Short Circuit

The utility for the Woolly Mammoth Theatre was contacted in order to obtain the existing information on short circuit current. The information was unavailable. Therefore the short circuit current calculation could not be carried out.



Copper versus Aluminum Wiring

		FEEDER S	CHEDULE		
FEEDER	SERVING	SERVING FROM	WIRE	CONDUIT	GROUND
1	L4	S1	4 #5000 KCMIL	3- 1/2 "	1 #3
2	M3, M2	S1	4 #5000 KCMIL	3- 1/2 "	1 #3
3	L5	S1	4 #4/0	2- 1/2"	1 #4
4	TP, 100 A AUDIO	S1	3 #250 KCMIL	2- 1/2"	1 #4
5	T1	S1	4 #1	1- 1/2"	1 #8
6	Т	S1	4 #5000 KCMIL	3- 1/2 "	1 #3
7	DM1	S1	(2) 3 #400 KCMIL, 2 #400 KCMIL N	3- 1/2 "	1 #2
8	DM2	S1	(2) 3 #400 KCMIL, 2 #400 KCMIL N	3- 1/2 "	1 #2
9	M1	S2	4 #5000 KCMIL	3- 1/2 "	1 #3
10	CH-1	S2	(2) 3 #250 KCMIL	2- 1/2"	1 #1
11	ELEVATOR	S2	3 #1	1- 1/2"	1 #6
12	FREIGHT ELEVATOR	S2	3 #1/0	1- 1/2"	1 #6
13	WH	S2	3 #3/0	2"	1 #6
14	WH	S2	3 #3/0	2"	1 #6
15	PB	S2	4 #5000 KCMIL	3- 1/2 "	1 #3



	COPPER TO ALUMINUM WIRING SIZING AND COST ANALYSIS												
					COPPE	R WIRING							
FEEDER NUMBER	OCPD (AMPS)	(/	WIRE SI AWG OR K			PRI	CE PER LII	NEAR FOO	т	LENGTH (FT)	PRICE		
		CONDUCTORS	NEUTRAL	GROUND	CONDUIT	CONDUCTORS	NEUTRAL	GROUND	CONDUIT				
1	400	3 #500	1 #500	1 #3	3-1/2 "	\$4.20	\$4.20	\$0.50	\$19.65	120	\$4,434.00		
2	400	3 #500	1 #500	1 #3	3-1/2 "	\$4.20	\$4.20	\$0.50	\$19.65	140	\$5,173.00		
3	225	3 #4/0	1 #4/0	1 #4	2-1/2"	\$1.81	\$1.81	\$0.41	\$11.20	160	\$3,015.20		
4	250	3 #250		1 #4	2-1/2"	\$2.16		\$0.41	\$11.20	65	\$1,175.53		
5	225	3 #1	1 #1	1 #8	1-1/2"	\$0.80	\$0.80	\$0.80	\$5.20	20	\$184.00		
6	400	3 #500	1 #500	1 #3	3-1/2 "	\$4.20	\$4.20	\$0.50	\$19.65	20	\$739.00		
7	600	(2) 3 #400	2 #400	1 #2	3-1/2 "	\$3.40	\$3.40	\$0.63	\$19.65	20	\$949.60		
8	600	(2) 3 #400	2 #400	1 #2	3-1/2 "	\$3.40	\$3.40	\$0.63	\$19.65	20	\$949.60		
9	400	3 #500	1 #500	1 #3	3-1/2 "	\$4.20	\$4.20	\$0.50	\$19.65	200	\$7,390.00		
10	550	(2) 3 #250		1 #1	2-1/2"	\$2.16		\$0.80	\$11.20	25	\$624.00		
11	150	3 #1		1 #6	1-1/2"	\$0.80		\$0.27	\$5.20	190	\$1,494.35		
12	200	3 #3/0		1 #6	1-1/2"	\$0.94		\$0.27	\$7.10	160	\$1,629.60		
13	200	3 #3/0		1 #6	2"	\$0.94		\$0.27	\$7.10	15	\$152.78		
14	200	3 #3/0		1 #6	2"	\$0.94		\$0.27	\$7.10	20	\$203.70		
15	400	3 #500	1 #500	1 #3	3-1/2 "	\$4.20	\$4.20	\$0.50	\$19.65	115	\$4,249.25		
		TOTAL PRICI								Æ	\$32,363.60		
					ALUMIN	JM WIRING							
FEEDER NUMBER	OCPD (AMPS)	(/	WIRE SI AWG OR K		ALUMIN		CE PER LII	NEAR FOO	т	LENGTH (FT)	PRICE		
		(/ CONDUCTORS					CE PER LI	NEAR FOO	T		PRICE		
			AWG OR K	CMIL)		PRI			-		PRICE \$2,840.40		
NUMBER	(AMPS)	CONDUCTORS (2) 3 #4/0	AWG OR K	CMIL) GROUND	CONDUIT	PRI	NEUTRAL	GROUND	CONDUIT	(FT)			
NUMBER 1	(AMPS) 400	CONDUCTORS	AWG OR K NEUTRAL 2 #4/0	CMIL) GROUND 1 #1	CONDUIT 3"	PRI CONDUCTORS \$1.00	NEUTRAL \$1.00	GROUND \$0.51	CONDUIT \$15.20	(FT) 120	\$2,840.40		
NUMBER 1 2	(AMPS) 400 400	CONDUCTORS (2) 3 #4/0 (2) 3 #4/0 3 #250	AWG OR K NEUTRAL 2 #4/0 2 #4/0	CMIL) GROUND 1 #1 1 #1	CONDUIT 3" 3" 3"	PRI CONDUCTORS \$1.00 \$1.00 \$1.22	NEUTRAL \$1.00 \$1.00	GROUND \$0.51 \$0.51 \$0.35	CONDUIT \$15.20 \$15.20 \$15.20	(FT) 120 140	\$2,840.40 \$3,313.80		
NUMBER 1 2 3 4	(AMPS) 400 400 225	CONDUCTORS (2) 3 #4/0 (2) 3 #4/0 3 #250 3 #350	AWG OR K NEUTRAL 2 #4/0 2 #4/0 1 #250	CMIL) GROUND 1 #1 1 #1 1 #2 1 #2	CONDUIT 3" 3" 3" 3"	PRI CONDUCTORS \$1.00 \$1.20 \$1.22 \$1.71	NEUTRAL \$1.00 \$1.00 \$1.22	GROUND \$0.51 \$0.51 \$0.35 \$0.35	CONDUIT \$15.20 \$15.20 \$15.20 \$15.20	(FT) 120 140 160 65	\$2,840.40 \$3,313.80 \$3,268.80 \$1,344.20		
NUMBER 1 2 3	(AMPS) 400 400 225 250	CONDUCTORS (2) 3 #4/0 (2) 3 #4/0 3 #250 3 #350 3 #250	AWG OR K NEUTRAL 2 #4/0 2 #4/0 1 #250 1 #250	CMIL) GROUND 1 #1 1 #1 1 #2 1 #2 1 #2 1 #2	CONDUIT 3" 3" 3" 3" 3" 3"	PRI CONDUCTORS \$1.00 \$1.22 \$1.71 \$1.22	NEUTRAL \$1.00 \$1.22 \$1.22	GROUND \$0.51 \$0.35 \$0.35 \$0.35 \$0.35	CONDUIT \$15.20 \$15.20 \$15.20 \$15.20 \$15.20	(FT) 120 140 160 65 20	\$2,840.40 \$3,313.80 \$3,268.80 \$1,344.20 \$104.60		
NUMBER 1 2 3 4 5	(AMPS) 400 400 225 250 225	CONDUCTORS (2) 3 #4/0 (2) 3 #4/0 3 #250 3 #350 3 #250 (2) 3 #4/0	AWG OR K <u>NEUTRAL</u> 2 #4/0 2 #4/0 1 #250 1 #250 2 #4/0	CMIL) GROUND 1 #1 1 #2 1 #2 1 #2 1 #2 1 #1	CONDUIT 3" 3" 3" 3" 3" 3" 3" 3"	PRI CONDUCTORS \$1.00 \$1.22 \$1.71 \$1.22 \$1.71 \$1.22 \$1.00	NEUTRAL \$1.00 \$1.22 \$1.22 \$1.22 \$1.00	GROUND \$0.51 \$0.35 \$0.35 \$0.35 \$0.35 \$0.35	CONDUIT \$15.20 \$15.20 \$15.20 \$15.20 \$15.20 \$15.20 \$15.20	(FT) 120 140 160 65 20 20	\$2,840.40 \$3,313.80 \$3,268.80 \$1,344.20 \$104.60 \$473.40		
NUMBER 1 2 3 4 5 6	(AMPS) 400 225 250 225 400	CONDUCTORS (2) 3 #4/0 (2) 3 #4/0 3 #250 3 #350 3 #250 (2) 3 #4/0 (2) 3 #4/0	AWG OR K NEUTRAL 2 #4/0 2 #4/0 1 #250 1 #250	CMIL) GROUND 1 #1 1 #1 1 #2 1 #2 1 #2 1 #2	CONDUIT 3" 3" 3" 3" 3" 3" 3" 5"	PRI CONDUCTORS \$1.00 \$1.22 \$1.71 \$1.22 \$1.00 \$2.00	NEUTRAL \$1.00 \$1.22 \$1.22	GROUND \$0.51 \$0.35 \$0.35 \$0.35 \$0.35	CONDUIT \$15.20 \$15.20 \$15.20 \$15.20 \$15.20	(FT) 120 140 160 65 20	\$2,840.40 \$3,313.80 \$3,268.80 \$1,344.20 \$104.60 \$473.40 \$1,214.40		
NUMBER 1 2 3 4 5 6 7 8	(AMPS) 400 225 250 225 400 600	CONDUCTORS (2) 3 #4/0 (2) 3 #4/0 3 #250 3 #350 3 #250 (2) 3 #4/0 (2) 3 #4/0 (2) 3 #400 (2) 3 #400	AWG OR K <u>NEUTRAL</u> 2 #4/0 2 #4/0 1 #250 1 #250 2 #4/0 2 #4/0 2 #400 2 #400	GROUND 1 #1 1 #1 1 #2 1 #2 1 #2 1 #1 1 #2 1 #2 1 #2/0 1 #2/0	CONDUIT 3" 3" 3" 3" 3" 3" 3" 5" 5"	PRI CONDUCTORS \$1.00 \$1.22 \$1.71 \$1.22 \$1.71 \$1.22 \$1.00 \$2.00 \$2.00	NEUTRAL \$1.00 \$1.22 \$1.22 \$1.00 \$2.00 \$2.00	GROUND \$0.51 \$0.51 \$0.35 \$0.35 \$0.35 \$0.51 \$0.72	CONDUIT \$15.20 \$15.20 \$15.20 \$15.20 \$15.20 \$15.20 \$15.20 \$44.00 \$44.00	(FT) 120 140 160 65 20 20 20 20 20	\$2,840.40 \$3,313.80 \$3,268.80 \$1,344.20 \$104.60 \$473.40 \$1,214.40 \$1,214.40		
NUMBER 1 2 3 4 5 6 7 8 9	(AMPS) 400 225 250 225 400 600 600 400	CONDUCTORS (2) 3 #4/0 (2) 3 #4/0 3 #250 3 #350 3 #250 (2) 3 #4/0 (2) 3 #4/0 (2) 3 #4/0 (2) 3 #4/0	AWG OR K <u>NEUTRAL</u> 2 #4/0 2 #4/0 1 #250 1 #250 2 #4/0 2 #4/0 2 #400	CMIL) GROUND 1 #1 1 #1 1 #2 1 #2 1 #2 1 #1 1 #2/0 1 #2/0 1 #1	CONDUIT 3" 3" 3" 3" 3" 3" 3" 5" 5" 5" 3"	PRI CONDUCTORS \$1.00 \$1.22 \$1.71 \$1.22 \$1.00 \$2.00 \$2.00 \$1.00	NEUTRAL \$1.00 \$1.00 \$1.22 \$1.22 \$1.22 \$1.00 \$2.00	GROUND \$0.51 \$0.51 \$0.35 \$0.35 \$0.35 \$0.51 \$0.72 \$0.51	CONDUIT \$15.20 \$15.20 \$15.20 \$15.20 \$15.20 \$15.20 \$44.00 \$44.00 \$15.20	(FT) 120 140 160 65 20 20 20 20 20 20 200	\$2,840.40 \$3,313.80 \$3,268.80 \$1,344.20 \$104.60 \$473.40 \$1,214.40 \$1,214.40 \$1,694.00		
NUMBER 1 2 3 4 5 6 7 8 9 10	(AMPS) 400 225 250 225 400 600 600 400 550	CONDUCTORS (2) 3 #4/0 (2) 3 #4/0 3 #250 3 #350 3 #250 (2) 3 #4/0 (2) 3 #4/0 (2) 3 #4/0 (2) 3 #4/0 (2) 3 #4/0 (2) 3 #4/0	AWG OR K <u>NEUTRAL</u> 2 #4/0 2 #4/0 1 #250 1 #250 2 #4/0 2 #4/0 2 #400 2 #400	GROUND 1 #1 1 #1 1 #2 1 #2 1 #2 1 #1 1 #2 1 #1 1 #2/0 1 #2/0 1 #1 1 #2/0 1 #1	CONDUIT 3" 3" 3" 3" 3" 3" 5" 5" 5" 5" 3" 3-1/2"	PRI CONDUCTORS \$1.00 \$1.22 \$1.71 \$1.22 \$1.00 \$2.00 \$2.00 \$1.00 \$2.00 \$2.00	NEUTRAL \$1.00 \$1.22 \$1.22 \$1.00 \$2.00 \$2.00	GROUND \$0.51 \$0.51 \$0.35 \$0.35 \$0.35 \$0.72 \$0.51 \$0.72 \$0.51	CONDUIT \$15.20 \$15.20 \$15.20 \$15.20 \$15.20 \$15.20 \$44.00 \$44.00 \$15.20 \$15.20 \$44.00 \$15.20 \$15.20 \$44.00 \$15.20	(FT) 120 140 160 65 20 20 20 20 20 20 20 20 20 20	\$2,840.40 \$3,313.80 \$3,268.80 \$1,344.20 \$104.60 \$473.40 \$1,214.40 \$1,214.40 \$1,694.00 \$809.25		
NUMBER 1 2 3 4 5 6 7 8 9 10 11	(AMPS) 400 225 250 225 400 600 600 400 550 150	CONDUCTORS (2) 3 #4/0 (2) 3 #4/0 3 #250 3 #350 3 #250 (2) 3 #4/0 (2) 3 #4/0	AWG OR K <u>NEUTRAL</u> 2 #4/0 2 #4/0 1 #250 1 #250 2 #4/0 2 #4/0 2 #400 2 #400	GROUND 1 #1 1 #1 1 #2 1 #2 1 #2 1 #1 1 #2 1 #1 1 #2/0 1 #2/0 1 #2/0 1 #2/0 1 #2/0 1 #2/0 1 #2/0	CONDUIT 3" 3" 3" 3" 3" 3" 5" 5" 5" 3" 3-1/2" 2"	PRI CONDUCTORS \$1.00 \$1.22 \$1.71 \$1.22 \$1.00 \$2.00 \$2.00 \$1.00 \$2.00 \$1.00 \$2.00 \$1.00 \$2.00 \$1.00 \$2.00 \$1.00 \$2.00 \$1.00 \$2.00 \$1.00 \$2.00 \$0.72	NEUTRAL \$1.00 \$1.22 \$1.22 \$1.00 \$2.00 \$2.00	GROUND \$0.51 \$0.51 \$0.35 \$0.35 \$0.72 \$0.72 \$0.51 \$0.72 \$0.51	CONDUIT \$15.20 \$15.20 \$15.20 \$15.20 \$15.20 \$15.20 \$44.00 \$44.00 \$15.20 \$44.00 \$15.20 \$19.65 \$7.10	(FT) 120 140 160 65 20 20 20 20 20 200 200 25 190	\$2,840.40 \$3,313.80 \$3,268.80 \$1,344.20 \$104.60 \$473.40 \$1,214.40 \$1,214.40 \$1,694.00 \$809.25 \$1,807.85		
NUMBER 1 2 3 4 5 6 7 8 9 10 11 12	(AMPS) 400 225 250 225 400 600 600 600 400 550 150 200	CONDUCTORS (2) 3 #4/0 (2) 3 #4/0 3 #250 3 #350 3 #250 (2) 3 #4/0 (2) 3 #4/0 (2) 3 #4/0 (2) 3 #4/0 (2) 3 #4/0 3 #2/0 3 #4/0	AWG OR K <u>NEUTRAL</u> 2 #4/0 2 #4/0 1 #250 1 #250 2 #4/0 2 #4/0 2 #400 2 #400	CMIL) GROUND 1 #1 1 #1 1 #2 1 #2 1 #2 1 #1 1 #2/0 1 #2/0 1 #1 1 #2/0 1 #1 1 #2/0 1 #4 1 #4	CONDUIT 3" 3" 3" 3" 3" 3" 5" 5" 5" 3" 3-1/2" 2"	PRI CONDUCTORS \$1.00 \$1.00 \$1.22 \$1.71 \$1.22 \$1.00 \$2.00 \$2.00 \$2.00 \$2.00 \$2.00 \$2.00 \$1.00 \$1.00 \$2.00 \$1.00 \$2.00 \$1.00 \$2.00 \$1.00 \$1.00 \$2.00 \$0.72 \$1.00	NEUTRAL \$1.00 \$1.22 \$1.22 \$1.00 \$2.00 \$2.00	GROUND \$0.51 \$0.51 \$0.35 \$0.35 \$0.72 \$0.72 \$0.51 \$0.72 \$0.51 \$0.72 \$0.51	CONDUIT \$15.20 \$15.20 \$15.20 \$15.20 \$15.20 \$15.20 \$44.00 \$44.00 \$15.20 \$19.65 \$7.10 \$7.10	(FT) 120 140 160 65 20 20 20 20 20 200 25 190 160	\$2,840.40 \$3,313.80 \$3,268.80 \$1,344.20 \$104.60 \$473.40 \$1,214.40 \$1,214.40 \$1,694.00 \$809.25 \$1,807.85 \$1,654.40		
NUMBER 1 2 3 4 5 6 7 8 9 10 11 12 13	(AMPS) 400 225 250 225 400 600 600 600 400 550 150 200	CONDUCTORS (2) 3 #4/0 (2) 3 #4/0 3 #250 3 #350 3 #250 (2) 3 #4/0 (2) 3 #4/0 (2) 3 #4/0 (2) 3 #4/0 3 #2/0 3 #4/0 3 #4/0	AWG OR K <u>NEUTRAL</u> 2 #4/0 2 #4/0 1 #250 1 #250 2 #4/0 2 #4/0 2 #400 2 #400	CHIL) GROUND 1 #1 1 #1 1 #2 1 #2 1 #2 1 #2 1 #1 1 #2/0 1 #2/0 1 #1 1 #2/0 1 #1 1 #2/0 1 #1 1 #2/0 1 #1 1 #2 1 #1 1 #2 1 #1 1 #2 1 #4 1 #2 1 #4 1 #4	CONDUIT 3" 3" 3" 3" 3" 3" 5" 5" 5" 3" 3-1/2" 2" 2" 2"	PRI CONDUCTORS \$1.00 \$1.00 \$1.22 \$1.71 \$1.22 \$1.00 \$2.00 \$2.00 \$2.00 \$2.00 \$1.00 \$2.00 \$1.00 \$2.00 \$1.00 \$2.00 \$1.00 \$2.00 \$1.00 \$1.00 \$2.00 \$1.00 \$1.00 \$1.00 \$1.00 \$1.00 \$1.00 \$1.00 \$1.00 \$1.00 \$1.00 \$1.22 \$1.71 \$1.22 \$1.00 \$2.00 \$1.00 \$1.00 \$1.00 \$1.00 \$1.00 \$1.00 \$1.00 \$1.00 \$1.00 \$1.00 \$1.00 \$1.22 \$1.00 \$1.00 \$1.00 \$1.00 \$1.00 \$1.00 \$1.00 \$1.00 \$1.00 \$1.00 \$1.00 \$1.00 \$1.00 \$1.00 \$1.00 \$2.00 \$1.00 \$0.72 \$1.00 \$1.00	NEUTRAL \$1.00 \$1.22 \$1.22 \$1.00 \$2.00 \$2.00	GROUND \$0.51 \$0.51 \$0.35 \$0.35 \$0.72 \$0.71 \$0.72 \$0.51 \$0.72 \$0.51 \$0.72 \$0.51 \$0.72 \$0.51 \$0.72 \$0.51	CONDUIT \$15.20 \$15.20 \$15.20 \$15.20 \$15.20 \$15.20 \$44.00 \$44.00 \$15.20 \$44.00 \$15.20 \$19.65 \$7.10 \$7.10 \$7.10	(FT) 120 140 160 65 20 20 20 20 20 20 20 20 20 20	\$2,840.40 \$3,313.80 \$3,268.80 \$1,344.20 \$104.60 \$473.40 \$1,214.40 \$1,214.40 \$1,694.00 \$809.25 \$1,807.85 \$1,654.40 \$155.10		
NUMBER 1 2 3 4 5 6 7 8 9 10 11 12	(AMPS) 400 225 250 225 400 600 600 600 400 550 150 200	CONDUCTORS (2) 3 #4/0 (2) 3 #4/0 3 #250 3 #350 3 #250 (2) 3 #4/0 (2) 3 #4/0 (2) 3 #4/0 (2) 3 #4/0 (2) 3 #4/0 3 #2/0 3 #4/0	AWG OR K <u>NEUTRAL</u> 2 #4/0 2 #4/0 1 #250 1 #250 2 #4/0 2 #4/0 2 #400 2 #400	CMIL) GROUND 1 #1 1 #1 1 #2 1 #2 1 #2 1 #1 1 #2/0 1 #2/0 1 #1 1 #2/0 1 #1 1 #2/0 1 #4 1 #4	CONDUIT 3" 3" 3" 3" 3" 3" 5" 5" 5" 3" 3-1/2" 2"	PRI CONDUCTORS \$1.00 \$1.00 \$1.22 \$1.71 \$1.22 \$1.00 \$2.00 \$2.00 \$2.00 \$2.00 \$2.00 \$2.00 \$1.00 \$1.00 \$2.00 \$1.00 \$2.00 \$1.00 \$2.00 \$1.00 \$1.00 \$2.00 \$0.72 \$1.00	NEUTRAL \$1.00 \$1.22 \$1.22 \$1.00 \$2.00 \$2.00	GROUND \$0.51 \$0.51 \$0.35 \$0.35 \$0.72 \$0.72 \$0.51 \$0.72 \$0.51 \$0.72 \$0.51	CONDUIT \$15.20 \$15.20 \$15.20 \$15.20 \$15.20 \$15.20 \$44.00 \$44.00 \$15.20 \$19.65 \$7.10 \$7.10	(FT) 120 140 160 65 20 20 20 20 20 200 25 190 160	\$2,840.40 \$3,313.80 \$3,268.80 \$1,344.20 \$104.60 \$473.40 \$1,214.40 \$1,214.40 \$1,694.00 \$809.25 \$1,807.85 \$1,654.40		

Characteristics of Copper and Aluminum

CHARACTERISTICS	COPPER	ALUMINUM
Tensile strength (lb/in ²).	55,000	25,000
Tensile strength for same conductivity (lb).	55,000	40,000
Weight for same conductivity (lb).	100	48
Cross section for same conductivity $(C.M.)$.	100	160
Specific resistance (Ω /mil ft).	10.6	17



Copper and aluminum are the two most commonly used conductors. Copper has the highest conductivity of all engineering metals. The ampacity of copper conductors is about 1.6 times that of aluminum conductors of the same size, because of the coppers higher conductivity. This means that copper wire is smaller than all equivalent ampacity aluminum cables. Smaller wire means it is easier and less expensive to install. The smaller diameter and less stiffness of the insulation allow flexibility and require less effort to bend into position during installation. Copper is hard and stronger than aluminum, which means it is more resistive to abuse during installation. Copper connections run cooler than the aluminum equivalent meaning that copper connections will have a longer life.

On a first look basis aluminum cable can be cheaper than copper cable. But the lifecycle cost, including cable life, cost of installation, materials, maintenance, repairs and possible replacement must be considered. Also the potential liability of poor performance must be taken into account. The most important aspect is "life". The longest life has the lowest total cost and will provide the greatest value. The problem comes with predicting the life of an aluminum wire, because the predicting would be from short-term accelerated laboratory tests. The life of a copper wire is predicted through actual field performance.

Conclusion

Commercial wiring is a long-term asset and is critical to the investment and performance that directly affects the profitability of a building. When weighing the advantages of copper and aluminum, copper is the better choice. Aluminum has a lower initial cost, but the many disadvantages outweigh the cost savings. Copper has unparalleled reliability for over a century, and should not be replaced by aluminum.



Compact Fluorescent Comparison

The following analysis is a comparison between screw base compact fluorescents and pin base compact fluorescents. The lamp and ballast cut-sheets can be found in Appendix B-2.

Statistics

	CFL Comparison			
	Screw Base	Pin Base		
Ballast	Integral	Remote		
Wattage	23 W	26 W		
Life	10,000 hr	12,000 hr		
CRI	82	82		
сст	3000 K	3000 K		
Initial Lumens at 25 C	1450	1710		
Mean Lumens at 25 C	1160	1470		
Maximum Overall Length	5.875"	6.5"		
Lumen Maintenance Curve		100% 90% 90% 80% 80% 80% 80% 60% 60% 55% 50% 0 1000 2000 3000 4000 5000 6000 7000 8000 5000 10000 Burning Hours		
Spectral Power Distribution Curve	0.14 0.12 0.00 0.00 0.00 0.00 0.00 0.00 0.00	The set of		



As seen above, the two lamps are very similar in statistical information. The important difference in the two types of lamps is the ballast. Screw base CFLs are self ballasted, having the ballast inside the lamp. This makes it usable in retrofit applications where incandescent lamps were used. Pin base CFLs need a separate ballast to work properly. Therefore pin base CFLs only work in CFL fixtures made specifically for the pin based lamp.

Screw base compact fluorescents have been known to be finicky. This is due to their self-ballasting component. Ballast failure is a random process that can be compared with the standard failure profile for any electronic device. There is an initial small peak of failures, followed by a drop and steady increase over lamp life. The life of all electronics largely depends on the operating temperature. For every 10°C temperature rise, typical the life of the electronic is cut in half. This is why the quoted lamp life of CFLs is at 25°C. The average life of electronics is greater than this, so at this temperature most electronics will not fail due to failure of the electronics. A specific application of this is when screw base CFLs are run base-up. This results in hotter electronics and a shorter average life. Also when they are used in enclosed fixtures, the ambient temperature will rise dramatically due to the ballast.

There are also other problems with screw base compact fluorescents, noted by lighting designers in the industry. The screw base CFLs may not always fit in the luminaire. This is because the CFL is larger than a standard incandescent lamp, due to the ballast portion. Also if the lamp is viewable there may be a shadow due to the ballast compartment, depending where the base is in relation to the shade. The screw base CFL can only be run at 120 volts. Therefore it can not be used in many applications were voltages other than 120 volts are used. When re-lamping occurs, if the fixture is a screw base there is a good chance maintenance will re-lamp with an incandescent. This will drastically effect the power consumption in a building. If the luminaire is pin based, there can be no mistake of the lamp type to re-lamp with. Ecologically, when lamp life is taken into account the screw base CFL produces more waste going into the environment.

The main application for screw base compact fluorescents is for retrofit. When a screw base CFL is compared to an incandescent lamp, the CFL is much more efficient and will save the consumer money. Studies show that CFLs can save a consumer up to 66% on their energy bill and will last ten times longer than standard incandescent fixtures. In commercial applications, screw base CFLs are rarely specified in a new design. This is where the pin base CFLs are ideal. These CFLs are used when compact fluorescents are chosen for a design from the beginning.

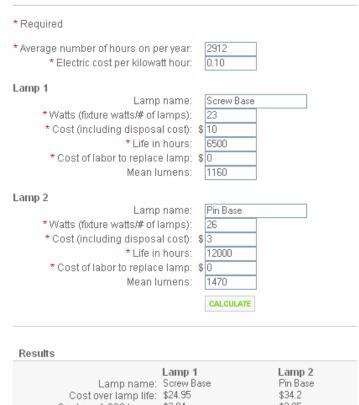


Cost Comparison

Simple Life-Cycle Cost Estimator

Compare the life-cycle costs for two different lamps.

Enter the following information and click "calculate." Your results will display below.



Cost per 1,000 hours: \$3.84 \$2.85 Cost per year: \$11.18 \$8.3 Cost per million lumen hours: \$3.31 \$1.94 Savings with Lamp 2: \$2.88 Ayear

A cost comparison has been done of a screw base luminaire and lamp, versus a pin base luminaire, lamp and ballast. The luminaires are assumed to be used an average of 2912 hours per year. The electric cost per kilowatt hour is \$0.10. The screw base CFL is assumed to only last 2/3 of its life.

According to the study, \$2.88 per lamp will be saved per year. Now we will assume we have 25 luminaires. That is a savings of \$72 per year, which is a savings of \$1440 over twenty years. Yet ballast and luminaire cost have not been taken into account. Each ballast costs on average \$30.00 and each luminaire will cost on average \$20 more (to have pin-base). This is an initial cost of \$1250. Therefore over the twenty year space, only \$190 will be saved. With the pin base system, the lamp gives off more lumens, and consequently less luminaires will be needed. Or if the same number of luminaires were used, they could be dimmed to extend lamp life further.



Conclusion

In commercial applications, pin base compact fluorescents are almost always specified. This is due to reliability, voltage consideration, aesthetics, performance and cost. The screw base compact fluorescent should only be used in the application it was produced for, retrofit. The screw base CFL is a better option in many cases than an incandescent lamp. When it is used in the wrong application, its lamp life is shortened and it can be unreliable.



Mechanical Breadth



Mechanical Breadth

Research

A hydronic system is the ideal solution for the heating system in many commercial buildings, including the Woolly Mammoth Theatre. This type of heating system provides many advantages over other systems that would benefit a theatre such as yours, including comfort, efficiency (which will result in lower operating costs), versatility, noise reduction, and reliability. All of these aspects are very important in a theater environment and should be taken into account when the heating system is designed for the Woolly Mammoth Theatre.

Comfort

There are many reasons why a hydronic heating system works so well, and these are closely related to the way the system works. A building needs a heating system so the occupants are comfortable in the space year round, including the frigid winter and the milder spring and fall seasons. Occupants are uncomfortable when they are not warm enough or are in a drafty room. When it is cold outside, a building loses heat to the exterior via conduction, convection and radiation. Many factors effect how quickly a space loses heat to the outside, including the amount of insulation in the walls and ceiling, the amount of glazing, how cold it is outside compared to inside, and how strong the wind is blowing. Also, heat moves from warmer objects to colder ones. As a building loses heat to the cold air, the occupants lose heat to the building and the colder objects in it (walls, windows, etc.). The heating system in a building must replace the cold being lost to the outdoors and at the same time not be drafty or create hot/cold spots in the building. (Bell & Gossett)

A hydronic system works to create a comfortable environment according to the previous provisions. In a hydronic heating system, boiler heated water is transported through pipes quietly and efficiently to radiators, baseboard convectors or radiant floors_to heat up this equipment. In each space these warm surfaces are created. The occupants, as well as surrounding cold walls and ceilings, are then sent heat by the warm objects. (Energy)

In a hydronic system, there is no air blowing around the room. Therefore there is almost no draft to make people feel uncomfortable. In addition, because a hydronic system is heating objects and people through radiating surfaces rather than hot air, the air does not dry out as much. A hydronic system makes it easier to maintain a comfortable humidity level during the winter season, and does not overheat the air. Another plus in this type of system is the thermostat can be set at a lower temperature for each zone, and the room will still feel comfortable. (Bell & Gossett)

Figure 1.0a is the ideal situation for heating in a space. The thick vertical line represents the temperature at a range of locations between the ceiling and floor. Notice from this diagram that the line is rather flat from ceiling to floor, with the temperature being slightly warmer at the floor and slightly cooler at the ceiling. This situation will optimize occupant comfort. Figure 1.0b is the diagram representing a space heated by a hydronic



system. Hydronic systems offer a very even heating of a space because they use mostly radiant heating rather than convective heating. This diagram has a temperature line very closely matched to the ideal situation diagram. (Bell & Gossett)

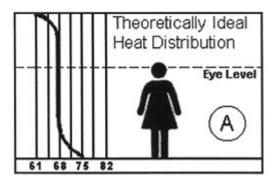
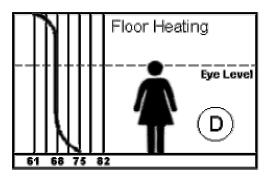
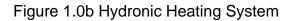


Figure 1.0a Ideal Heating System





Efficiency

A hydronic system is more efficient than other systems. This is because water is a better carrier of heat than air. Water conducts heat twenty times faster than air. Air is a good insulator, but is not the best heating medium. A given volume of water can hold almost 3,500 times as much heat as the same volume of air, for the same temperature rise in each material. Water can move a lot of heat (BTU's) from one place, where it is produced, to another place, where it is used very efficiently. Also a hydronic system is more efficient because there is no heat loss through cracks, around doors and windows as with an air system. It is a completely sealed system. This is because the heat is mostly being radiated into the space rather than blown into it. Fewer BTU's need to be produced to keep the space feeling comfortable, because of the lower heat loss. (Bell & Gossett) A more efficient system will dramatically save on the operating cost for the heating system. Buildings utilizing hydronic heating systems have a 30% *or more* savings on heating bills. (US)

Noise

One of the most important and appealing advantages of a hydronic heating system for the Woolly Mammoth Theatre is that the system is virtually silent. The boiler is located away from the space, so there is no mechanical equipment noise. A loud heating system is detrimental to a theater. In a theater setting, the space must be completely free of extraneous noises. During a performance, patrons should not hear any mechanical equipment working. It will take away from the intimate connection the actors have with the audience during a performance. (Hurlcon)

Versatility



Hydronic systems are very versatile systems. With a hydronic system, 40,000 BTU's can be moved through a ³/₄" copper pipe through walls and between floors quietly and efficiently. With an air system, an 8" by 14" duct would be necessary to move that many BTU's into a space. (Bell & Gossett) Therefore, using a hydronic system is a space saver. The required ductwork of an air system is many times larger than the piping for a hydronic system. (BC) In the Woolly Mammoth Theatre, because of the unfinished concrete spaces, a small copper pipe would be much more inconspicuous than a large duct running across the ceiling. A hydronic system will not draw attention to itself and will let the architectural impression be more prominent.

A hydronic system has the flexibility to run off of many different fuel sources. It can be powered by gas, oil, electricity or even solar energy. Also, the type of fuel source used can be changed by just buying a new boiler for the new fuel source of choice. This aspect is very appealing because the lifespan of a building is a long time. Over that time period, the price or availability of a specific fuel may change. When electricity is being used, in some geographical locations special heating or off-peak rates are available to consumers. This can bring the cost equal to or less expensive than the use of other fossil fuels. (Warmly)

Zoning the building is very simple when using a hydronic system. A building can be zoned by rooms, floors or any way the owner would like. (Bell & Gossett) Each zone is thermostatically controlled by valves that regulate the flow of hot water to control the temperature in each zone. Any or all zones may operate at one time. (Stein)

Reliability

Hydronic systems are very reliable. The majority of maintenance is on the pumps and boilers. Most pumps are maintenance free, using water to lubricate the bearings. This allows for a more quiet and efficient life span. Usually pumps have an estimated life span of ten years. Boilers do require routine maintenance. Many installers of boilers will offer a yearly maintenance package, which includes cleaning and general up-keep. Different types of boilers will require different maintenance. (Warmly)

Other Factors

Hydronic systems are environmentally clean systems. The boiler heats the water, and is then circulated. Being a closed system, the radiators and natural convectors provide clean natural heat to the space. There is no forced air circulation through ducts that accumulate dust and allergens and distribute them throughout the building. (Hydronic)

Hydronic systems are also very modular and expandable. Radiators can be added as the needs of the building change. Once a boiler of the appropriate size is installed, radiators/convectors are able to be added as needed. If an extension or renovation is done on the building, the new area must be plumbed and the radiators/convectors added as



required. In an air system, an expansion is much more extensive and complicated. (Hurlcon)

Electric Heating System versus Hydronic Heating System

Existing Electric Resistive Heating System

Electric Heating Coils

Equipment	kW	Cost
DH-1	15	\$360.00
DH-2	50	\$655.00
DH-3	20	\$550.00
DH-4	10	\$510.00
DH-5	25	\$690.00
DH-6	10	\$410.00
	130	\$3,175.00 Total

Energy Consumption

Pepco Rating Periods

•	-
On-Peak Period	12:00 Noon to 8:00 PM
Int-Peak Period	8:00 AM to 12:00 Noon 8:00 PM to 12:00 Midnight
Off- Peak Period	12:00 Midnight to 8:00 AM Saturdays, Sundays and Holidays
For a 7 day week	
On- Peak	40 hr
Int- Peak	40 hr
Off- Peak	88 hr



	EXIST	TING SYSTEM- MON			
		Billing Months of June- October	kW	Billing Months of November- May	kW
			130		130
GENERATION					
kW-hr Charge	On Peak	\$0.08682 per kW-h	\$451.46	\$0.06889 per kW-h	\$358.23
	Intermediate	\$0.06632 per kW-h	\$344.86	\$0.07239 per kW-h	\$376.43
	Off Peak	\$0.05645 per kW-h	\$645.79	\$0.05757 per kW-h	\$658.60
kW Charge	On Peak	\$0.84507 per kW	\$109.86		
KW Charge	Maximum	\$0.30248 per kW	\$39.32	\$0.30248 per kW	\$39.32
	Waximum	\$0.50240 per KW	ψ09.02	ψ0.30240 per κw	ψ09.02
TRANSMISSION					
All kW-h		\$0.00111 per kW-h	\$24.24	\$0.00111 per kW-h	\$24.24
kW Charge	On Peak	\$0.71000 per kW	\$92.30	\$6100111 poi itt ii	¥= ···= ·
	Maximum	\$0.59000 per kW	\$76.70	\$0.59000 per kW	\$76.70
		T			
DISTRIBUTION					
Customer Charge		\$20.93000 per month	\$20.93	\$20.90000 per month	\$20.90
All kW-h		\$0.01029 per kW-h	\$224.73	\$0.01029 per kW-h	\$224.73
kW Charge	Maximum	\$4.80000 per kW	\$624.00	\$4.80000 per kW	\$624.00
			•		· ·
Delivery Tax		\$0.00770 per kW-h	\$168.17	\$0.00770 per kW-h	\$168.17
Public Space Occupancy Surcharge		\$0.00154 per kW-h	\$33.63	\$0.00159 per kW-h	\$34.73
Reliability Energy Trust		\$0.00065 per kW-h	\$14.20	\$0.00065 per kW-h	\$14.20
Fund Gneration Procurement	-				
Credit		\$0.00002 per kW-h	\$0.44	\$0.00002 per kW-h	\$0.44
SUB-TOTAL			\$2,870.64		\$2,620.68
			\$109.86		\$0.00
			\$39.32		\$39.32
Subtrac	ting once monthly	/ charges	\$92.30		\$0.00
Subliat		y onargeo	\$76.70		\$76.70
			\$20.93		\$20.90
			\$624.00]	\$624.00
Billing for average 7 c	lay week less den	nand and peak charges	\$1,907.53]	\$1,859.76
Billing for 1 mor	nth less demand a	and peak charges	\$7,630.11]	\$7,439.04
Rilling for	1 month of electr	ical service	\$8,593.22	1 1	\$8,199.96
			⊅0, Ĵ93.∠Z		\$0,133.90
Yearly Co	st of Electri	cal Service		\$100,365.80	

Note: Cyan Boxes Denote Standard Monthly Charge



New Hydronic Heating System System Assumptions

The average house of 2,000 SQ FT uses 100,000 Btu/hr. The Woolly Mammoth Theatre is 32,000 SQ FT. This is equivalent to 16 houses. Therefore the assumed heating load is 1.6 million Btu/hr or 1600 MBH.

The existing cooling system is a hydronic cooling system. The pipes for the new hydronic heating system would be the same pipes if the system is a 2 pipe system, and parallel pipes if the system is a 4 pipe system. Therefore the existing information on pressure was used. The new system is assumed to have 30' of head loss, and be two pumps in parallel.

The return and supply air temperatures were estimated. The return air is assumed to be 140 degrees F, while the supply air is assumed to be 160 degrees F. This gives a delta T of 20 degrees.

Calculations

$$\label{eq:Q} \begin{split} \mathsf{Q} &= \mathsf{m} \; \mathsf{dot} \, {}^* \, \mathsf{C}_\mathsf{p} \, \Delta \; \mathsf{T} \\ \mathsf{m} \; \mathsf{dot} &= \mathsf{Q} \; / \; (\mathsf{C}_\mathsf{p} \, \Delta \; \mathsf{T}) \end{split}$$

$$\label{eq:cp} \begin{split} C_p &= 1.0 \text{ Btu / (Ibm°F)} \\ & \Delta \text{ T} = 20^\circ \text{ F} \end{split}$$

m dot = (1,600,000 Btu/hr) / ((1.0 Btu/lbm°F)*(20° F)) m dot = 80,000 lb/hr = 160 gpm

Hydronic Heating Equipment Sizing and Cost

The energy use for the coil was assumed to be 65,000 Btus. All equipment cutsheets can be found in Appendix C. All equipment price data from Costworks 2005. Assumptions on the equipment selection can be found in Appendix C.

Load: 1.6 million Btu/hr or 1600 MBH Flow Rate: 160 gpm Pump Head: 30'

New Hydronic System

Equipment	Btu	Cost	
Boiler	2,000,000	\$12,300.00	
Coils	60,000	\$425.00	
Pumps (2)	100,416	1200	
	2,160,416	\$13,925.00	Total



MODIFIED SYSTEM- MONTHLY NATURAL GAS COSTS							
			Therms (100,000 Btu)				
			21.60				
SYSTEM	•						
Heating and/or Cooling	\$17.00000	per month	\$17.00				
Non-heating and Non-cooling	\$11.75000	per month	\$11.75				
MONTHLY							
January	\$1.0957	per therm	\$23.67				
February	\$1.0957	per therm	\$23.67				
March	\$0.9833	per therm	\$21.24				
April	\$0.9833	per therm	\$21.24				
Мау	\$0.9390	per therm	\$20.28				
June	\$0.7543	per therm	\$16.29				
July	\$0.7543	per therm	\$16.29				
August	\$0.7331	per therm	\$15.83				
September	\$0.8568	per therm	\$18.51				
October	\$0.8603	per therm	\$18.58				
November	\$0.9512	per therm	\$20.55				
December	\$1.0957	per therm	\$23.67				
DISTRIBUTION							
First 125 therms	\$0.30930	per therm	\$6.68				
Next 875 therms	\$0.25030	per therm	\$0.00				
Over 1,000 therms	\$0.19030	per therm	\$0.00				
SUBTOTAL MON	NTHLY COSTS		\$35.43				
Monthly Costs Incu	\$425.17						
Yearly Cost of El	ectrical Serv	vice	\$664.99				

Initial Cost Difference Energy Cost Difference Payback Period \$10,750.00 \$99700.00 0.12 of a year = about 6 weeks

Conclusion

The hydronic heating system is a more efficient system than the electric resistive heating system. It also has many other advantages including comfort, versatility and reliability. If the Woolly Mammoth Theatre were to install this type of system, the payback would be a short time of about 6 weeks. This is a very good payback period, showing that the system is a better choice than electric resistive heating.



Acoustical Breadth



Acoustical Breadth Study

The Woolly Mammoth Theatre is a live performance theatre. It is about 6000 SQ FT with 265 seats. The seating includes 187 orchestra seats and 78 balcony seats. Acoustics play a very important role in the function of the theatre. The theatre has been designed as a courtyard configuration to connect the audience with the actors in a close setting. The theatre company's goal is to produce live productions for the community. They value the connection between the actor and the audience, and therefore expect the theatre to be a very intimate atmosphere. Their goal is to produce intimate performances where the audience will forget they are in a large public atmosphere.

Reverberation time is defined as the time required for sound to decay 60 dB after the source has stopped. The recommended reverberation time for small theaters is between 1.2 to 1.4 seconds. Yet because of the theatre company's goal, the theater will be designed to have a reverberation time between small theaters and intimate drama. The reverberation time for intimate drama is between 0.9 and 1.1. Therefore the goal reverberation time for the Woolly Mammoth Theatre is 1.15 seconds.

Many different types of sound absorbing materials can be used to control reverberation to the ideal level. The larger a volume is, the longer the reverberation time will be. This is because sounds waves will have travel farther to hit room surfaces, than in a small room. Sound absorption is a great asset because the sound can me made to see like it is coming directly from the actual source, rather from all around the room.

The Sabine formula for reverberation will be used in this analysis:

T = 0.05 V/a T = reverberation time (s) V = room volume (CU FT) a = total SQ FT of room absorption (sabins)

The Existing Design

Materials

The existing design has many materials to be taken into account when doing a reverberation time calculation. The floors in the theatre are concrete in the seating areas, and the rest is heavy carpet on concrete. The stage is wood. There are many different wall materials throughout the space. The side walls are concrete block wall. The back wall of the first floor is a gypsum board wall, and the back wall of the balcony level is perforated metal acoustical wall baffles, with a control room window. The ceiling in the theatre is a concrete slab ceiling. The balcony railings and catwalks must also be taken into account. The railings of the balconies are wood paneled, and the catwalks are metal.



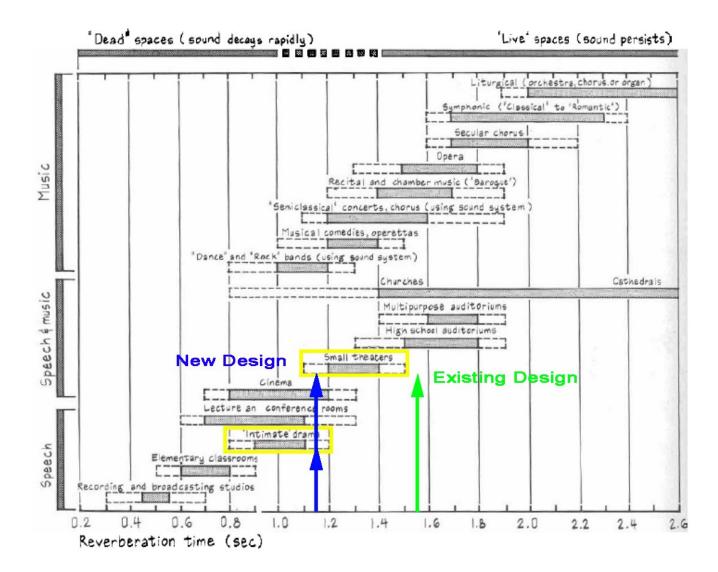
Acoustic Calculations

Sound Absorption Data For Materials														
Surface	Material	Surface Area	125	Hertz	250	Hertz	500	Hertz	100) Hertz	200	0 Hertz	400	0 Hertz
Туре	Description	(SF)	alpha	sabins	alpha	sabins	alpha	sabins	alpha	sabins	alpha	sabins	alpha	sabins
	Concrete slab floor- clear satin finish	1105	0.010	11.05	0.010	11.05	0.015	16.58	0.020	22.10	0.020	22.10	0.020	22.10
Floor	Wood	921	0.150	138.15	0.110	101.31	0.100	92.10	0.070	64.47	0.060	55.26	0.070	64.47
	Heavy carpet on concrete	2089	0.020	41.78	0.060	125.34	0.140	292.46	0.370	772.93	0.600	1253.40	0.650	1357.85
	Painted gypsum board	900	0.100	90.00	0.080	72.00	0.050	45.00	0.030	27.00	0.030	27.00	0.030	27.00
	Concrete block wall painted	3000	0.100	300.00	0.050	150.00	0.060	180.00	0.070	210.00	0.090	270.00	0.080	240.00
Walls	Control room window	110	0.180	19.80	0.060	6.60	0.040	4.40	0.030	3.30	0.020	2.20	0.020	2.20
	Satin silver perforated metal accoustical wall baffles	682	0.700	477.40	0.860	586.52	0.740	504.68	0.880	600.16	0.950	647.90	0.860	586.52
Balcony Railing Fronts	Wood	286	0.150	42.90	0.110	31.46	0.100	28.60	0.070	20.02	0.060	17.16	0.070	20.02
Catwalks	Metal	400	0.050	20.00	0.100	40.00	0.100	40.00	0.100	40.00	0.070	28.00	0.020	8.00
Ceiling	Concrete slab ceiling- clear finish	2849	0.010	28.49	0.010	28.49	0.015	42.74	0.020	56.98	0.020	56.98	0.020	56.98
Audience	Audience in upholstered seats, per SF of floor area	1865	0.600	1119.00	0.740	1380.10	0.880	1641.20	0.960	1790.40	0.930	1734.45	0.850	1585.25
			Total Sabins	2289		2533		2888		3607		4114		3970

Reverberation Time Calculation										
	125 Hertz	125 Hertz 250 Hertz 500 Hertz 1000 Hertz 2000 Hertz 4000 He								
Alpha Total Absorption (Sabins)	2288	2533	2888	3607	4114	3970				
V Volume (CU FT)	100000	100000	100000	100000	100000	100000				
T Reverberation Time (sec)	2.18	1.97	1.73	1.39	1.22	1.26				

The average reverberation time between 500 and 1000 Hertz in the existing theater is 1.56 seconds. This is above the ideal reverberation time of the theater. Therefore, added absorptive material should be used in the space.





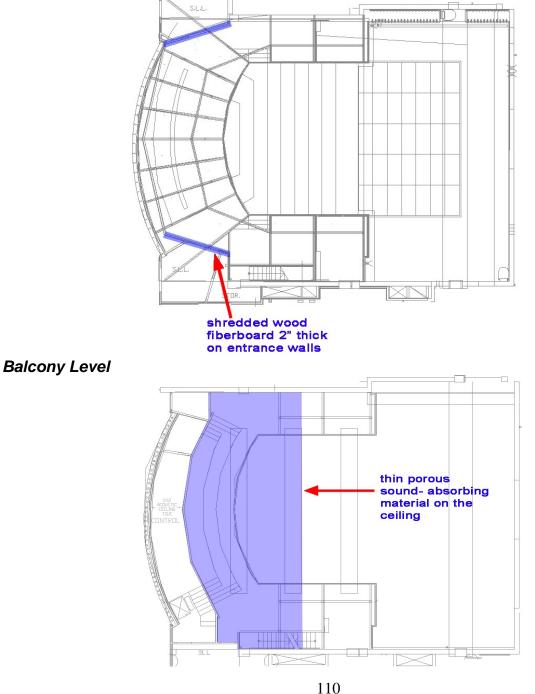
109



The New Design Materials

The new acoustic design for the theatre has incorporated two new absorbing acoustical materials. In the new acoustic design for the theatre, two new sound-absorbing materials were incorporated to the existing design. On the orchestra level, the north and south entrance walls were covered with 2" thick fiberboard. Also a thin porous sound absorbing material was added to the back half of the theater's ceiling.

Orchestra Level Plan





	Sound Absorption Data For New Design Materials															
Surface	Material	Surface Area	125	Hertz	250	Hertz	Hertz 500 Hertz 1000 Hertz		1000 Hertz		500 Hertz 1000 Hertz		200	2000 Hertz		0 Hertz
Туре	Description	(SF)	alpha	sabins	alpha	sabins	alpha	sabins	alpha	sabins	alpha	sabins	alpha	sabins		
	Concrete slab floor- clear satin finish	1105	0.010	11.05	0.010		0.015		0.020	22.10	0.020		0.020			
Floor	Wood	921	0.150	138.15	0.110	101.31	0.100	92.10	0.070	64.47	0.060	55.26	0.070	64.47		
	Heavy carpet on concrete	2089	0.020	41.78	0.060	125.34	0.140	292.46	0.370	772.93	0.600	1253.40	0.650	1357.85		
	Painted gypsum board	900	0.100	90.00	0.080	72.00	0.050	45.00	0.030	27.00	0.030	27.00	0.030	27.00		
	Concrete block wall painted	3000	0.100	300.00	0.050	150.00	0.060	180.00	0.070	210.00	0.090	270.00	0.080	240.00		
	Control room window	110	0.180	19.80	0.060	6.60	0.040	4.40	0.030	3.30	0.020	2.20	0.020	2.20		
Walls	Satin silver perforated metal accoustical wall baffles	682	0.700	477.40	0.860	586.52	0.740	504.68	0.880	600.16	0.950	647.90	0.860	586.52		
	Shredded Wood Fiberboard, 2in thick on concrete	340	0.150	51.00	0.260	88.40	0.620	210.80	0.940	319.60	0.640	217.60	0.920	312.80		
Balcony Railing Fronts	Wood	286	0.150	42.90	0.110	31.46	0.100	28.60	0.070	20.02	0.060	17.16	0.070	20.02		
Catwalks	Metal	400	0.050	20.00	0.100	40.00	0.100	40.00	0.100	40.00	0.070	28.00	0.020	8.00		
Ceiling	Thin porous sound abosorbing material 3/4" thick	1100	0.10	110.00	0.60	660.00	0.80	880.00	0.82	902.00	0.78	858.00	0.60	660.00		
	Concrete slab ceiling clear finish	1749	0.010	17.49	0.010	17.49	0.015	26.24	0.020	34.98	0.020	34.98	0.020	34.98		
Audience	Audience in upholstered seats, per SF of floor area	1865	0.600	1119.00	0.740	1380.10	0.880	1641.20	0.960	1790.40	0.930	1734.45	0.850	1585.25		
			Total Sabins	2439		3270		3962		4807		5168		4921		

Reverberation Time Calculation									
	125 Hertz	250 Hertz	500 Hertz	1000 Hertz	2000 Hertz	4000 Hertz			
Alpha Total Absorption (Sabins)	2439	3270	3962	4807	5168	4921			
V Volume (CU FT)	100000	100000	100000	100000	100000	100000			
T Reverberation Time (sec)	2.05	1.53	1.26	1.04	0.97	1.02			

The average reverberation time between 500 and 1000 Hertz of the new design is 1.15 seconds. This is the ideal reverberation time for the Woolly Mammoth Theatre.

Conclusion

The primary concern in the theater is to have an ideal reverberation time, while keeping the aesthetic concept of an "unfinished" edgy space. The absorbent material was added to the ceiling, which is not in the main line of view in the theatre. Fiberboard was also added on the entrance walls in the back of the first floor. The absorbent materials were placed very carefully to not disturb the architectural concept of the theatre. The ceiling and the back entrance walls are inconspicuous places to add absorbent material. The added material lowered the reverberation time the ideal time of 1.15. This reverberation time falls in the high end of the RT for intimate drama and on the low end of the RT for small theatres.



Final Conclusions

The Woolly Mammoth was a very exciting space to analyze. Even though it was a relatively small building, each space was complex, well thought out and had many distinctive architectural elements. The unique client in this process was a key element as well. The Woolly Mammoth Theatre Company had a distinct vision for their first "home". This had to be kept in mind when designing the theatre.

In my lighting redesign, I have taken the new edgy and provocative personality of the theatre company and put it in the lighting design. Color, texture, and technology were used to make the spaces come alive. The unfinished industrial finishes now glow with color or are highlighted to sparkle. The concept fits perfectly into the architectural theme of a "transparent theatrical laboratory". The spaces have a high-tech, flashy, and dynamic feel to them. The new lighting design was then electrically redesigned. The lobby and canopy are now easily controlled by a dimming system. This will give the theatre company the flexibility and aesthetic quality they want. The lighting electrical system for the Woolly Mammoth Theatre enhances the space to a higher level of quality and aesthetics.

From this analysis, I have learned a great deal. I now understand more about the industry and how the process of designing and constructing a building comes together. Also the fact that each discipline's design affects other disciplines immensely. A design can't just be the right lighting, electrical or mechanical design; it must fit in with all of the building systems. All disciplines are working toward a similar end goal, to make the best building possible.



References

Egan, David M.. Architectural Acoustics (1988). Boston: McGraw-Hill Custom Publishing.

Hughes, David S. Electrical Systems in Buildings (1988). Albany, NY: Delmar Inc.

National Electric Code Committee. 2002 National Electric Code. National Fire Protection Agency, 2002.

Rea, Mark S. IESNA Lighting Handbook. 9th ed (2000). New York, NY: Illuminating Engineering Society.

Waier, Philip R. 2005 RS Means Building Construction Cost Data. 63rd Annual ed. Kingston, MA: RSMeans Company Inc, 2005.

ASHRAE 90.1 (2004) Energy Standards

Integrated Publishing. *Electrical engineering training series*. Retrieved April 10, 2007 from <u>http://www.tpub.com/neets/book4/11e.htm</u>

Canadian Copper and Brass Development Associations. The colour of trust. Retrieved April 10, 2007 from <u>http://www.coppercanada.ca/pdfs/33e.pdf</u>

Stein, Benjamin & Reynolds, John. (1999). *Mechanical and electrical equipment for buildings (9th edition).* Hoboken, NJ: John Wiley & Sons Inc.

Energy and Power Management. *Choosing the best HVAC system*. Retrieved March 22, 2007 from <u>http://www.energyandpowermanagement.com</u>

US Department of Energy. *Selecting a home heating system*. Retrieved March 22, 2007 from <u>http://www.energycodes.gov/implement/pdfs/lib_ks_selecting_a_home_heating_system.pdf</u>

Hydronic Heating Association. *Did you know?*. Retrieved March 22, 2007 from <u>http://www.comfortableheat.net/diduknow.html</u>

Hurlcon. *What is hydronic heating*. Retrieved March 22, 2007 from <u>http://www.hurlcon.com.au/heat/what.html/</u>

BC Hydro. *Residential hydronic heating*. Retrieved March 22, 2007 from <u>http://www.bchydro.com/rx_files/pshome/pshome1580.pdf</u>

Bell & Gossett. *Comfort Heating*. Retrieved March 22, 2007 from http://www.bellgossett.com/homeowners/BG-Hydronics101.asp/

Warmly Yours. *Hydronic Radiant Heating Maintenance*. Retrieved March 22, 2007 from <u>http://www.radiant-floor-heating.com/hydronic-price.htm/</u>



Acknowledgments

There are many people I would like to thank who have helped me get where I am today. First and foremost, I would like to thank my mom and dad. They have encouraged me throughout the years, giving me the determination to accomplish my dreams. They are the reason I made it to Penn State, and survived the last five years. They have endlessly given me the confidence to know I will succeed. I could not have done this without them.

Next I would like to thank C.M. Kling and Associates for providing me with such an interesting building to study. A special thanks to Andrea Hartranft for being an amazing resource in the industry. I would also like to thank Aram Ebben from Gallegos Lighting Design for all the help and encouragement. Thank you for taking the time to teach me all that you have. I could not have asked for a better mentor.

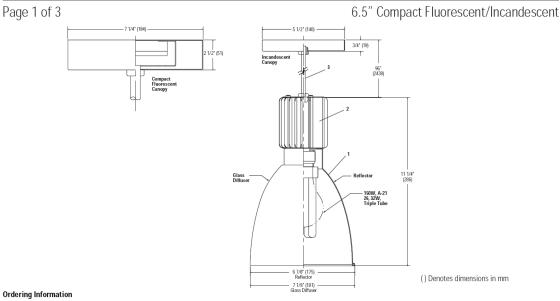
Thank you to the AE Department for guiding me through the senior thesis and to all the professors who assisted me in completing this project.

Lastly, I would like to thank my fellow AEs. You have all helped in your own ways, from teaching to making me laugh. A special thank you to Angela Nudy, Alexis Kreft, Corie Ambler, Maggie Machinsky, Sara Schonour and Lindsay Rekuc. When I thought I couldn't do it, you were right there telling me that WE could.

Appendix A-1

Fixture Type A1

Decorative Performance Pendalyte **406**



Power Head and Suspension: Titanium Finish									
Catalog No.	Lamp	Watts	Volts	Suspension					
406U2	CFL Triple Tube	26/32	120/277	Straight Cord					
406151	Incandescent A21	150	120	Straight Cord					

Ref	lector/	G	ass

Reflectof/Glass	
Catalog No.	Description
416SR	Satin Aluminum Reflector
416WH	White Glass
416BL	Cobalt Blue Glass
416AB	Amber Glass

Features

- 2. Power Head Housing: One-piece extruded aluminum.
- 3. Suspension: Power Cord, SJT/18-3 (incandescent), SJT/18-5 (Compact Fluorescent) black finish. Canopy, 20 gage, .036 CRS, titanium finish. Can be field shortened.

Lamping (by others) Incandescant: 150W, A-21

Compact Fluorescent: Universal for 4-Pin, 26/32 watt, base: GX24q-3

General Electric	Osram/Sylvainia	Philips
------------------	-----------------	---------

(1) 26W Triple Tube 4-Pin (Amalgam) Compact Fluorescent Lamp							
F26TBX/*/A/4P CF26DT/E/IN/* PL-T26W/*/4P							
(1) 32W Triple Tube 4-Pin (Amalgam) Compact Fluorescent Lamp							
F32TBX/*/A/4P CF32DT/E/IN/* PL-T32W/*/4P							

* Manufacturers' color temperature designation

Electrical

Lampholders:

Incandescent: Medium Based, Porcelain, Nickel-Plated Screw Shell Compact Fluorescent: 4-pin, 26/32 watt base: GX24Q-3 Ballast: Fluorescent: Electronic

	26	Watt	32 Watt		
Voltage	120	277	120	277	
Total Input Watts	28	28	36	36	
Max. Line Current (Amps)	.25	.11	.30	.09	
Ballast Factor	1.02	1.02	1.00	1.00	

THD<10%, Minimum Starting Temperature: 0°F Power Factor >0.98

Labels

cULus listed suitable for damp locations.

Job Information Type:

Job Name: Cat. No.:

Lamp(s):

Notes:

www.lightolier.com Lightolier a Genlyte company www.lightolier.co 631 Airport Road, Fall River, MA 02720 • (508) 679-8131 • Fax (508) 674-4710 We reserve the right to change details of design, materials and finish. © 2004 Genlyte Group LLC • C0605



^{1.} Reflector System:

Reflector: High purity, 16 gauge aluminum. Exterior satined and anodized. Interior low iridescent comfort clear anodized.

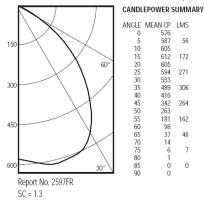
Glass Diffusers: Pressed colored glass with soft etched exterior and matte white interior fritt.

Decorative Performance Pendalyte **406**

Page 2 of 3

6.5" Compact Fluorescent/Incandescent

Satin Aluminum Reflector Catalog No. 406U2 / 416SR, 32W CFL, 2400 Lumens.



ZON	al lumen	S AND PE	RCENTAGES
ZONE	LUMENS	% LAMP	%LUMINAIRE
0-30	500	20.84	38.92
0-40	806	33.58	62.72
0-60	1231	51.32	95.84
0-90	1285	53.55	100.00
40-90	479	19.96	37.28
60-90	53	2.23	4.16
90-180	0	.00	.00
0-180	1285	53.55	100.00
	** EFFICI	ENCY = 53.	5% **

COEFFICIENTS OF UTILIZATION

Ce	iling		80)%		709	%	50	1%	30)%	
W	all	70	50	30	10	50	10	50	10	50	10	0
RC	R	Zoi	nal C	avity	Meth	iod - Ef	ffect	ive Flo	oor Re	flecta	ince =	20%
	0	.64	.64	.64	.64	.62	.62	.59	.59	.57	.57	.54
	1	.60	.58	.57	.56	.57	.55	.55	.53	.53	.51	.49
	2	.57	.54	.51	.49	.53 .	.48	.51	.47	.49	.46	.44
	3	.53	.49	.46	.43	.48	.43	.47	.42	.45	.41	.40
	4	.50	.45	.41	.39	.44 .	.38	.43	.38	.42	.37	.36
.9	5	.46	.41	.37	.34	.40	.34	.39	.34	.38	.33	.32
Ra	6	.43	.37	.33	.31	.37	.30	.36	.30	.35	.30	.29
ΪŢ	7	.40	.34	.30	.27	.33 .	.27	.33	.27	.32	.26	.25
NB)	8	.37	.31	.27	.24	.30	.24	.30	.24	.29	.24	.23
Ē	9	.34	.28	.24	.21	.28	.21	.27	.21	.27	.21	.20
Room Cavity Ratio	10	.32	.26	.22	.19	.25	.19	.25	.19	.24	.19	.18

Determined In Accordance With Current IES Published Procedures Luminaire Imput Watts = 33.0

White Glass Reflector Catalog No. 406U2 / 416WH, 32W CFL, 2400 Lumens.

114

119

117

107

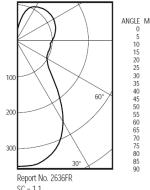
91

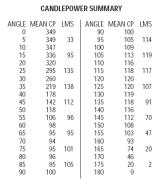
70

47

20

2





01 L/			
ZON	al lumen	S AND PE	RCENTAGES
ZONE	LUMENS	% LAMP	%LUMINAIRE
0-30	263	10.98	16.47
0-40	401	16.71	25.06
0-60	609	25.39	38.08
0-90	910	37.94	56.90
40-90	509	21.23	31.83
60-90	301	12.55	18.81
90-180	689	28.74	43.10
0-180	1600	66.68	100.00
	** EFFICI	ENCY = 66.	7% **
	ZONE 0-30 0-40 0-60 0-90 40-90 60-90 90-180	ZONAL LUMENS 0.30 263 0.40 401 0.60 609 0.90 910 40.90 509 60.90 301 90.180 689 0.180 1600	0-30 263 10.98 0-40 401 16.71 0-60 609 25.39 0-90 910 37.94 40-90 509 21.23 60-90 301 12.55 90-180 689 28.74

COEFFICIENTS OF UTILIZATION

Ce	iling		80	1%		70)%	50)%	30)%	
W	all	70	50	30	10	50	10	50	10	50	10	0
R	CR	Zor	nal C	avity	Meth	iod - E	ffect	ive Flo	oor Re	flecta	nce =	20%
	0	.73	.73	.73	.73	.68	.68	.58	.58	.50	.50	.38
	1	.65	.62	.58	.56	.57	.52	.49	.45	.42	.49	.29
	2	.59	.54	.49	.45	.50	.46	.43	.37	.37	.32	.24
	3	.54	.47	.42	.38	.44	.36	.38	.32	.32	.27	.21
	4	.50	.42	.37	.33	.40	.31	.34	.27	.29	.24	.18
9	5	.46	.38	.32	.28	.35	.27	.31	.24	.27	.21	.16
coom Cavity Ratio	6	.42	.34	.29	.25	.32	.23	.28	.21	.24	.19	.14
₹	7	.39	.31	.25	.22	.29	.21	.25	.19	.22	.16	.13
S.	8	.36	.28	.23	.19	.26	.18	.23	.17	.20	.15	.12
ε	9	.34	.26	.21	.17	.24	.16	.21	.15	.19	.13	.10
8	10	.32	.24	.19	.15	.22	.15	.20	.13	.17	.12	.09

Determined In Accordance With Current IES Published Procedures Luminaire Imput Watts = 31.0

SC = 1.1

Amber Glass Reflector Catalog No. 406U2 / 416AB, 32W CFL, 2400 Lumens. CANDLEPOWER SUMMARY

38

108

153

152

111

73

48

29

14

90 95 100

105 110

115

120 125 130

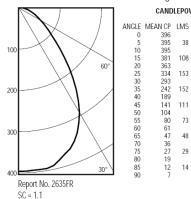
9

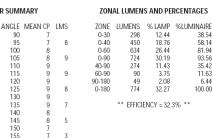
9

6 53

1

0 1 Ω





COEFFICIENTS OF UTILIZATION

Ceiling	80%	70%	50%	30%				
Wall	70 50 30 10	50 10	50 10	50 10	0			
RCR	Zonal Cavity Met	Zonal Cavity Method - Effective Floor Reflectance = 20%						
0	.38 .38 .38 .38 .35 .34 .33 .32	.37 .37 .33 .31	.35 .35 .32 .30	.33 .33 .30 .29	.30 .27			
2	.33 .31 .29 .28	.30 .27	.32 .30	.28 .26	.24			
3	.31 .28 .26 .24	.27 .24	.26 .23	.25 .23	.21			
	.29 .26 .24 .22	.25 .22	.24 .21	.23 .21	.19			
.e 5	.27 .24 .21 .19	.23 .19	.22 .19	.21 .18	.18			
6 Kat	.25 .22 .19 .18	.21 .17	.20 .17	.20 .17	.16			
£ 7	.23 .20 .17 .16	.19 .16	.19 .15	.18 .15	.14			
<u>₹</u> 8	.22 .18 .16 .14	.18 .14	.17 .14	.17 .14	.13			
ε 9	.20 .17 .14 .13	.16 .13	.16 .13	.15 .12	.12			
Room Cavity Ratio 01 6 8 2 9 5	.19 .15 .13 .12	.15 .12	.15 .11	.14 .11	.11			
Determined In Accordance With Current IES Published Procedures Luminaire Imput Watts = 31.0 Notes: Amber Glass and Cobalt Blue Glass have the same Photometrics. For 26W Lamp, multiply calculated Footcandle values by .75								

Job Information

38.54 58.14 81.94 93.56

35.42

11.63

6.44 100.00

Type:

Lightolier a Genlyte company www.lightolier.com 631 Airport Road, Fall River, MA 02720 • (508) 679-8131 • Fax (508) 674-4710 We reserve the right to change details of design, materials and finish. © 2004 Genlyte Group LLC • C0605



Lamp A1



Product Number: 20885

Order CF32DT/E/IN/835/ECO Abbreviation:

General Description:

DULUX 32W triple compact fluorescent amalgam lamp with 4-pin base, integral EOL, 3500K color temperature, 82 CRI, for us with electronic and dimming ballasts, ECOLOGIC

Product Information						
Abbrev. With Packaging Info.	CF32DTEIN835ECO 50/CS 1/SKU					
Average Rated Life (hr)	12000					
Base	GX24Q-3					
Bulb	T (T4)					
Color Rendering Index (CRI)	82					
Color Temperature/CCT (K)	3500					
Family Brand Name	Dulux® T/E					
Industry Standards	IEC 60901- 7432					
Initial Lumens at 25C	2328					
Mean Lumens at 25C	2002					
Maximum Overall Length - MOL (in)	5.6					
Maximum Overall Length - MOL (mm)	142					
NEMA Generic Designation (current)	CFTR32W/GX24Q/835					
NEMA Generic Designation (old)	CFM32W/GX24Q/835					
Nominal Wattage (W)	32.00					



Electrical Specifications

IZT-1T42-M2-BS@120

MARK 7 0-10V
Electronic Dimming
Programmed Start
Series
120-277
50/60HZ
Active

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.
CFM26W/GX24Q	1	26	50/10	0.25	08/29	0.05/1.00	14	0.95	1.4	3.45
* CFM32W/GX24Q	1	32	50/10	0.33	09/39	0.05/1.00	10	0.97	1.4	2.56
CFM42W/GX24Q	1	42	50/10	0.42	09/50	0.05/1.00	10	0.98	1.4	2.00
CFQ26W/G24Q	1	26	50/10	0.25	08/29	0.05/1.00	14	0.95	1.4	3.45

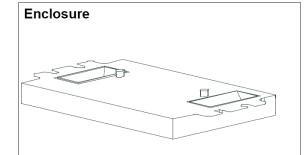


Green Terminal must be Grounded

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

Standard Lead Length (inches)

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



Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
4.98 "	3.00 "	1.29 "	2.00 "
4 49/50	3	1 29/100	2
12.6 cm	7.6 cm	3.3 cm	5.1 cm

Revised 06/18/2003



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

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

Job	Name:	

Type:

Order Number:

236 Series 12V PAR36/AR111

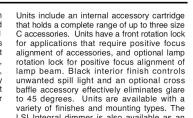


The 236 Series Spotlight is a specification grade medium and long throw unit designed for all of the low voltage PAR36 and AR111 energy conserving screw terminal lamps. Its clean architectural styling makes it the perfect unit for interior spaces such as museums, galleries, exhibits, malls and boutiques, residences and similar areas where a visually quiet, high-intensity light is needed. This unit features a low profile electronic tansformer integrated into the fitting.

This unit with its unique snap-in socket easily accepts both PAR36 and AR111 lamps, up to 75 watts.

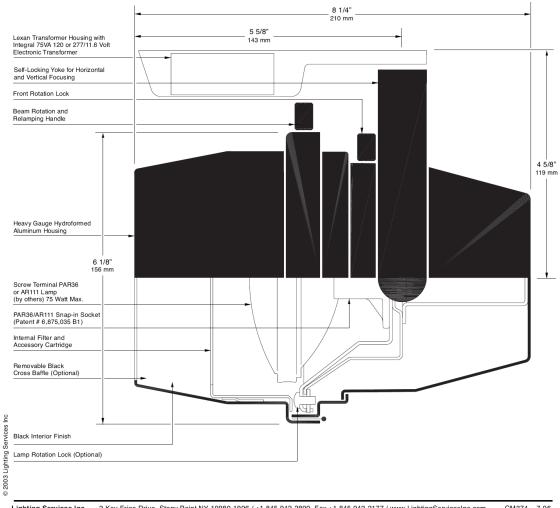
cULus Listed/CE Certified USA Manufactured/IBEW

236-00 (120V) V236-00 (277V)



LSI Integral dimmer is also available as an accessory for intensity control.

Protected under Patent # 6,875,035 B1





Job Name:

Туре

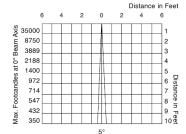
236 Series 12V PAR36/AR111

5°

Photometric Data 4

50PAR36/H/SP5° 50 watt/12 volt Spot/3050K Beam Spread to 50% of CBCP

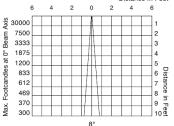
Center Beam Candlepower 35000



75AR111/8/SP 75 watt/12 volt

Spot/3000K Beam Spread to 50% of CBCP Center Beam Candlepower





Lamp Type

35PAR36/H/SP5° 35watt/12v, 4000 hours BeamSpread to 50% of CBCF 25000 Center Beam Candlepower Color Temperature 3050K

35PAR36/H/SP8° 35watt/12v, 4000 hours BeamSpread to 50% of CBCP Center Beam Candlepower 200 8 20000 Color Temperature 3050K

35PAR36/H/FL30° 35watt/12v, 4000 hours BeamSpread to 50% of CBCP Center Beam Candlepower 905 30 900 Color Temperature 3050K

50PAR36/H/SP5° 50watt/12v, 4000 hours BeamSpread to 50% of CBCP 5 Center Beam Candlepower Color Temperature 35000 3050K

50PAR36/H/SP8° 50watt/12v, 4000 hours BeamSpread to 50% of CBCP Center Beam Candlepower 30000 Color Temperature 3050K

50PAR36/H/FL30° 50watt/12v, 4000 hours BeamSpread to 50% of CBCP ່ 30° Center Beam Candlepower 1300 Color Temperature 3050K

50AR111/4/SSP 50watt/12v, 3000 hours BeamSpread to 50% of CBCP Center Beam Candlepower 30000 Color Temperature 3000K 50AR111/8/SP 50watt/12v. 3000 hours BeamSpread to 50% of CBCP 23000 Center Beam Candlepower Color Temperature 3000K

50AR111/25/FL 50watt/12v, 3000 hours BeamSpread to 50% of CBCP Center Beam Candlepower 25° 4000 Color Temperature 3000K

75AR111/8/SP 75watt/12v, 3000 hours 8° BeamSpread to 50% of CBCP Center Beam Candlepower 30000 Color Temperature 3000K

75AR111/25/FL 75watt/12v, 3000 hours BeamSpread to 50% of CBCP 25° Center Beam Candlepower 5300 Color Temperature 3000K

75AR111/45/WFL 75watt/12v, 3000 hours BeamSpread to 50% of CBCP 45° 1700 Center Beam Candlepower Color Temperature 3000K

Accessories

8°

30000

Louver C

1/2" cellular metal louver, controls spill light and glare, 45° cutoff.

Cross Baffle 236

1 3/4" deep internal cross baffle, controls spill light and glare, black.

Glass Color Filters, Size C

Selection of 95 permanent rimmed dichroic, and rimmed and slotted standard colors.

Spread Lens C990

Permanent glass for spreading light beam in one axis, 5° X 50°, rimmed and slotted for heat expansion.

Spread Lens C992

Permanent molded glass lens for spreading light beam in one axis-nominal 5°X 30°.

Spread Lens C995

Permanent molded glass lens for spreading light beam in all directions-nominal 50° X 50°.

Spread Lens C996 Permanent molded glass lens for spreading light beam slightly more in one direction than the other-nominal 45° X 50°.

Beam Softener C998

8

4

Permanent glass lens for conditioning light to create a softer beam.

OPTIVEX[™] UV Blocking Filter C962

Eliminates ultra-violet wavelengths below 410±10nm. Especially useful for conservation of artworks and to help prevent fading.

Light Blocking Screens, Size C C801S-20% Light Blocking, C802S-30% Light Blocking, C803S-40% Light Blocking Stainless Steel Screens. Used individually or in combination to reduce transmitted light without changing its color temperature.

Integral Dimmer For 120 Volt Yoke Mounted Dimmer add Suffix "D" to model number.



Ordering Information Model Number add prefix V for 277 Volt add suffix letters for finish

236-00⁵ Lexan Fitting for 1 and 2 circuit I SI Track With switch

236-3G

236-5E

boxes.

O.D. With switch, fuse and 6-foot

3-wire grounding

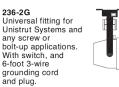
cord and plug.

on standard 4"

octagonal outlet

Order Number

8°







Lamp Locking

For permanent locking of lamp rotation, add suffix "RL" to model number. (example: 236RL-00)

Coiled Cord

18/3 105°C, 18" retracted, 6 foot extended. Specify by adding suffix **CC** to model number. White fixture supplied with white cord, all other finishes supplied with black cord.

Wrench Locking For permanent locking of fixture position, add suffix "WL" to model number.

Timoneo (Fam	Finis	hes	(Pain
--------------	-------	-----	-------

(suffix B) Black White (suffix W) Silver (suffix S) Graphite (suffix G) Platinum (suffix P

Notes: 1. CBCP = Center Beam Candlepower 2. K = Color Temperature in Kelvin degrees 3. OPTIVEX= glass is a trademark of Bausch & Lomb Inc. 4. Lamp manufacturer's published data 5. Not for use with Unimount or Emergency/Worklite track

Lighting Services Inc 2 Kay Fries Drive, Stony Point NY 10980-1996 / +1 845 942-2800 Fax +1 845 942-2177 / www.LightingServicesInc.com CM374 7-06

Lamp A2



Product Number: 55017

Order Abbreviation: 50PAR36/HAL/WFL30 12V

General Description: Tungsten Halogen CAPSYLITE PAR36 Screw Terminal <(>&<)> Spade Connector Base 50Watt 12Volt Wide Flood Beam

	Product Information
Abbrev. With Packaging Info.	50PAR36HALWFL3012V 12/CS 1/SKU
Approx. Lumens	700
Average Rated Life (hr)	4000
Base	Screw Terminal
Beam Angle (deg)	20
Beam Type	WFL
Bulb	PAR36
Centerbeam Candlepower (cp)	1400
Class	С
Diameter (in)	4 1/2
Diameter (mm)	114
Ecologic	Yes
Family Brand Name	CAPSYLITE® PAR36
Filament	C-8
Horizontal Beam Angle (deg)	30
Lamp Finish	Reflector
Maximum Overall Length - MOL (in)	2.750
Maximum Overall Length - MOL (mm)	70
Nominal Voltage (V)	12.00
Nominal Wattage (W)	50.00
Vertical Beam Angle (deg)	20

Type:_

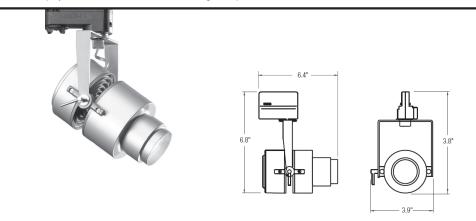
Project: _

TARGETTI

Foho Pro

MR16 Projector

Professional directional projector for use with an 50W MR16 Halogen lamp.



Details

Features

- Die-cast aluminum joints, fitted with graduated ring for tool-less aim locking
- Painted aluminum body with die-cast titanium-colored painted supports
- Mounts to wall, ceiling or track
- 359° horizontal rotation and 90° vertical tilt, with directional locking (90° locks in position)
- 120V electronic transformer separate from the optical assembly to optimize heat dispertion and ensure the lamp maintains a constant operating temperature

TARGETTI a division of TARGETTI NORTH AMERICA 1513 E. Saint Gertrude Place Santa Ana, CA 92705

- Available linear spread and softening lenses
- Accepts chromatic and UV stop filters

Lens

- Borosilicate safety glass

Lamp

– 50W max. MR16 Halogen lamp

www.targettiusa.com

Transformer

- Supplied with 120V primary, for 277V consult factory
- Thermal protection that meets UL and NEC requirements

Accessories (1 Max. per fixture)

- Framing projector
- Adjustable barn doors
- UV stop filter
- Chromatic filters in red, green, blue, yellow and magenta
- Consult factory for multiple accessories

Labels – UL listed



ph 714.957.4950 **fx** 714.957.4955

Copyright © 2006 TNA 6.06 PRO/TRK 5 V1



Ordering Information

Fixture					Accessories		
TRIM	CAT. #	MOUNT	LAMP	COLOR*	DESCRIPTION	COLOR	CAT. #
MR16 Projector —	US1T0687D1	Wall/Ceiling	50W MR16	White	Framing Projector	Aluminum	US1T0742
	US1T1376D1			Black	Adjustable Barn Doors	Black	US1T0741
	US1T0686D1	_		Aluminum	Chromatic Dichroic Filters – Ø 1.38"	Red	US49891
	US1T0691D1	Two Circuit		White	for use with Framing Projector	Green	US49892
	US1T1377D1	- Track		Black		Blue	US49896
	US1T0690D1	_		Aluminum		Yellow	US49897
						Magenta	US49898
					Chromatic Dichroic Filters –	Red	US49881
	6				Ø 2"	Green	US49882
	SA					Blue	US49886
						Yellow	US49887
		0				Magenta	US49959
			Chromatic /		UV Stop Filter	Clear	US49880
djustable Barn Doors	Framing Pro	Framing Projector (Corrective Filters	Light Peach	US1T1750
						Medium Peach	US1T1751
						Dark Peach	US1T1752
						Light Pink	US1T1741
						Medium Pink	US1T1742
						Dark Pink	US1T1743
						Light Blue	US1T1744
						Medium Blue	US1T1745
						Dark Blue	US1T1746
						Light Yellow	US1T1747
						Medium Yellow	US1T1748
						Dark Yellow	US1T1749

fx 714.957.4955

1513 E. Saint Gertrude Place

TARGETTI a division of TARGETTI NORTH AMERICA 1513 E. Saint Gertrude Santa Ana, CA 92705

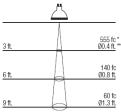
www.targettiusa.com

Foho Pro MR16 Projector

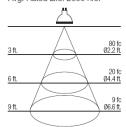
TARGETTI

Photometric Information





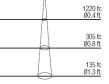
20MR16Q/40°/FL (BAB) CBCP: 700 cd Avg. Rated Life: 2000 hrs.



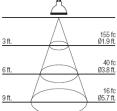
35MR16Q/8°/NSP (FRB) CBCP: 11,000 cd Avg. Rated Life: 3000 hrs. 3 ft.

6 ft.

9 ft.



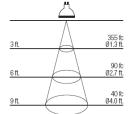
35MR16Q/35°/FL (FMW) CBCP: 1400 cd Avg. Rated Life: 3000 hrs.



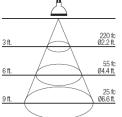
50MR16Q/12°/NSP (EXT) CBCP: 11,000 cd Avg. Rated Life: 3500 hrs. ...

	\bigtriangleup	
3 ft.	A	1220 fc Ø0.6 ft.
6 ft.	A	305 fc Ø1.3 ft.
<u>9 ft.</u>	6	135 fc Ø1.9 ft.

50MR16Q/25°/NFL (EXZ) CBCP: 3200 cd Avg. Rated Life: 3500 hrs.



50MR16Q/40°/FL (EXN) CBCP: 2000 cd Avg. Rated Life: 3500 hrs.



* fc= footcandles ** diameter in feet CBCP= center beam candle power cd= candella

TARGETTI a division of www.targettiusa.com

TARGETTI 1513 E. Saint Gertrude NORTH AMERICA Santa Ana, CA 92705

1513 E. Saint Gertrude Place

ph 714.957.4950 fx 714.957.4955

Copyright © 2006 TNA 6.06 PRO/TRK 5 V1



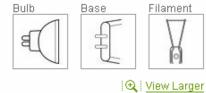
Lamp A3

20843 - Q71MR16/C/NSP15 GE MR16

GENERAL CHARACTERISTICS

Lamp type	Halogen - MR
Bulb	MR16
Base	2-Pin (GX5.3)
Filament	C-6
Wattage	71
Voltage	12
Voltage (MIN)	71
Rated Life	4000 hrs
Rated Life (Vert)	4000 hrs
Lamp Enclosure Type (LET)	Open or enclosed fixtures





PHOTOMETRIC CHARACTERISTICS

Initial Lumens	11500
Initial Lumens (Hor)	11500
Initial Lumens (Vert)	11500
Center Beam Candlepower (CBCP)	11500
Color Temperature	3050 K
Nominal Initial Lumens per Watt	161

DIMENSIONS

Maximum Overall Length (MOL)	1.8750 in (47.6 mm)
Bulb Diameter (DIA)	2.000 in (50.8 mm)

PRODUCT INFORMATION

Product Code	20843
Description	Q71MR16/C/NSP15
ANSI Code	EYF
Standard Package	BUNDLE
Standard Package GTIN	30043168208438
Standard Package Quantity	20
Sales Unit	Unit
No Of Items Per Sales Unit	1
No Of Items Per Standard Package	20
UPC	043168208437

ADDITIONAL RESOURCES

Cata	logs
Test	timonials
Bro	chures
P	roduct Brochures
•	Color
A	plication/Segment Brochures
•	Contractor Lighting
Sell	Sheets
• G	E ConstantColor® Precise™ MR16 Lamps
IES/	Photometric Download
MS)S (Material Safety Data Sheets)
Disr	osal Policies & Recycling Information

Type:

Order Number:

The miniaturized 260 series spotlight is integrated to a low profile, fitting extension that houses an electronic transformer. The hinged front is easily opened for relamping and inserting any double combination of the entire range of LSI AAA accessories. This fixture also incorporates a rotatable/lockable front for proper positioning of asymetrical distribution lenses. A special feature of this series is the removable front hinge assembly, which makes changing the entire front possible without tools, allowing the fixture to be transformed from a spotlight to a wallwash in seconds.

The 260 unit will accommodate all the energy efficient Tungsten Halogen MR16 lamps from 20 to 75 watts, in a wide variety of beam spreads.

These lamps give excellent color rendition and produce a more efficient, whiter brighter light than standard incandescent lamps, with longer life and less heat emission. This unit features no spill light or glare from the lamp through any part of the housing assembly, and it has a removable Cross Baffle as part of the fixture front which eliminates frontal spill light and glare.

260 Series 12V MR16

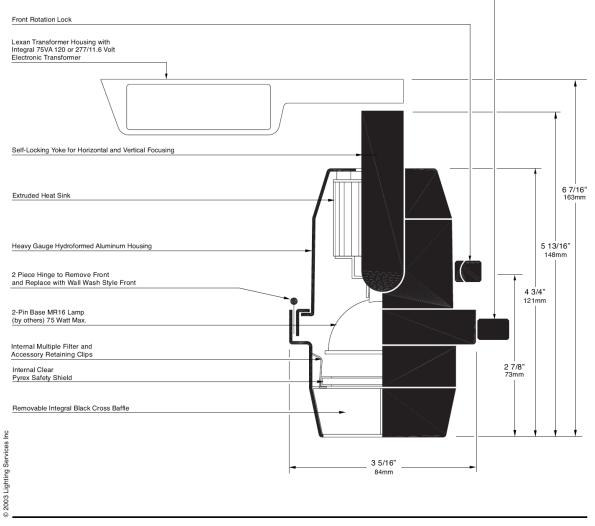
Units are self-locking in all horizontal and vertical planes and are available in standard LSI Black, White, Silver, Graphite, and Platinum finishes.

UL and CUL Listed / CE Certified USA Manufactured /IBEW

260-00 (120V) V260-00 (277V)

Relamping Handle

Job Name:



Lighting Services Inc 2 Kay Fries Drive, Stony Point NY 10980-1996 / +1 845 942-2800 Fax +1 845 942-2177 / www.LightingServicesInc.com CM373 1-07

Job Name:

Type:

 15°

40°

2200

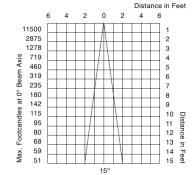
Order Number:

260 Series 12V MR16

Photometric Data⁵

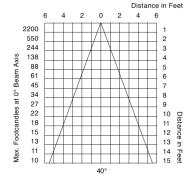
Q71MR16/C/NSP15° 71 watt/12 volt Narrow Spot/3050K Beam Spread to 50% of CBCP

Center Beam Candlepower 11500



Q71MR16/C/FL40° 71 watt/12 volt Flood/3050K Beam Spread to 50% of CBCF

Center Beam Candlepower



Lamp Types

Q20MR16/C/VNSP7° 20 watt/12 volt 3000 hours Beam Spreads to 50% of CBCP Center Beam Candlepower 7400 Color Temperature 2900K

Q20MR16/C/NSP15° 20 watt/12 volt 5000 hours Beam Spread to 50% of CBCP 15° Center Beam Candlepower 3750 Color Temperature 2900K

Q20MR16/C/FL40° 20 watt/12 volt 5000 hours Beam Spread to 50% of CBCP 40° Center Beam Candlepower 525 Color Temperature 2900K

Q35MR16/C/SP20° 35 watt/12 volt 5000 hours Beam Spread to 50% of CBCP 20 Center Beam Candlepower 3900 Color Temperature 3000K

Q35MR16/C/NFL40° 35 watt/12 volt 5000 hours Beam Spread to 50% of CBCP 40 Center Beam Candlepower 1000 Color Temperature 3000K

12300

3000K

Q42MR16/C/VNSP9° 42 watt/12 volt 3500 hours Beam Spread to 50% of CBCP Center Beam Candlepower Color Temperature

Lighting Services Inc

Q50MR16/C/NSP15° 50 watt/12 volt 6000 hours Beam Spread to 50% of CBCP 15 Center Beam Candlepower 9100 Color Temperature 3050K

Q50MR16/C/NFL25° 50 watt/12 volt 6000 hours Beam Spread to 50% of CBCP 25 Center Beam Candlepower 3200 Color Temperature 3050K

Q50MR16/C/NFL30° 50 watt/12 volt 6000 hours Beam Spread to 50% of CBCP 30 Center Beam Candlepower 2500 Color Temperature 3050K

Q50MR16/C/FL40° 50 watt/12 volt 6000 hours Beam Spread to 50% of CBCP 40 1700 Center Beam Candlepower Color Temperature 3050K

Q50MR16/C/WFL55° 50 watt/12 volt 6000 hours Beam Spread to 50% of CBCP 55 Center Beam Candlepower 900 3050K Color Temperature

Q71MR16/C/NSP15° 71 watt/12 volt 4000 hours Beam Spread to 50% of CBCP Center Beam Candlepower 15 11500 Color Temperature 3050K

Q71MR16/C/NFL25° 71 watt/12 volt 4000 hours Beam Spread to 50% of CBCP 25 Center Beam Candlepower 5500 Color Temperature 3050K

Q71MR16/C/FL40° 71 watt/12 volt 4000 hours Beam Spread to 50% of CBCP 40 Center Beam Candlepower 2200 Color Temperature 3050K

Accessories

261FR

Entire wall wash style front assembly including slash front, internal accessory clips, AAA995 spread lens and kicker-reflector, specify color.

Louver Hex AAA

Hexcell metal louver, controls spill light and glare, 45° cutoff, black finish.

Glass Color Filters, Size AAA Selection of 95 permanent rimmed dichroic and rimmed and slotted standard colors.

Spread Lens AAA992

ermanent molded glass lens for spreading light beam in one axis-nominal 5°X 30°.

Spread Lens AAA995

Permanent molded glass lens for spreading light beam in all directions—nominal 50° X 50°.

Spread Lens AAA996

Permanent molded glass lens for spreading light beam slightly more in one direction than the other-nominal 45° X 50°

Beam Softener AAA998

Permanent glass lens for conditioning light to create a softer beam.

OPTIVEX[™] UV Blocking Filter AAA962 Eliminates ultra-violet wavelengths below

410±10nm. Especially useful for conservation of artworks and to help prevent fading.

Light Blocking Screens, Size AAA

AAA801-20% Light Blocking, AAA802-30% Light Blocking, AAA803-40% Light Blocking Stainless Steel Screens. Used individually or in combination to reduce transmitted light without changing its color temperature.

Ordering Information Model Number

add prefix V for 277 Volt add suffix letters for finish

260-007

Lexan Fitting for and 2 circuit LSI Track With switch.

260-5E

Canopy for permanent mounting on standard 4' octagonal outlet boxes. With transformer.



Wrench Locking For permanent locking of fixture position, add "WL" to model number.

Finishes	(Paint)
Black	(suffix B)
White	(suffix W)
Silver	(suffix S)
Graphite	(suffix G)
Platinum	(suffix P)

1. CBCP = Center Beam Candlepowe

- CBOP = Center beam Candidpower
 K = Color Temperature in Kelvin degrees
 /C/ = Constant Color
 OPTIVEX= glass is a trademark of Bausch & Lomb Inc.
 LTL Test # 07121, 07123
 Lamp Manufacturers Published Data
 Not for use with Unimount or Emergency/Worklite track

2 Kay Fries Drive, Stony Point NY 10980-1996 / +1 845 942-2800 Fax +1 845 942-2177 / www.LightingServicesInc.com CM373 1-07

Lamp A4

20833 - Q50MR16/C/FL40 GE ConstantColor® Precise™ MR16

PHOTOMETRIC CHARACTERISTICS

Center Beam Candlepower 1700

Nominal Initial Lumens per 34

Initial Lumens

(CBCP)

Watt

(MOL)

DIMENSIONS

Initial Lumens (Hor)

Initial Lumens (Vert)

Color Temperature

GENERAL CHARACTERISTICS

	-
Lamp type	Halogen - MR
Bulb	MR16
Base	2-Pin (GX5.3)
Filament	C-6
Wattage	50
Voltage	12
Voltage (MIN)	50
Rated Life	6000 hrs
Rated Life (Vert)	6000 hrs
Lamp Enclosure Type (LET)	Open or enclosed fixtures

1700

1700

1700

3050 K

1.8750 in (47.6 mm)

2.000 in (50.8 mm)





ADDITIONAL RESOURCES

Catalogs

Testimonials

- Brochures
 - Application/Segment Brochures Beauty Salon Lighting
 - Contractor Lighting

 - <u>Gontactor Lighting</u>
 <u>Healthcare Lighting</u>
 <u>Office Lighting</u>
 <u>Specialty Store Lighting</u>
 Product Brochures

<u>Color</u> <u>XL Brochure</u>

- Sell Sheets
- GE ConstantColor® Precise™ MR16 Lamps

IES/Photometric Download

PRODUCT INFORMATION

Maximum Overall Length

Bulb Diameter (DIA)

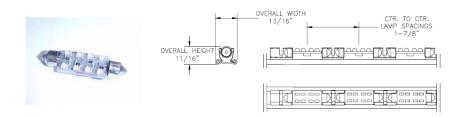
Product Code	20833
Description	Q50MR16/C/FL40
ANSI Code	EXN
Standard Package	BUNDLE
Standard Package GTIN	00043168208338
Standard Package Quantity	20
Sales Unit	Unit
No Of Items Per Sales Unit	1
No Of Items Per Standard Package	20
UPC	043168994262

MSDS (Material Safety Data Sheets) **Disposal Policies & Recycling Information**



TYPE:_____ CATALOG NUMBER:_____

CLIKSTRIP: LED ELEMENT LOW VOLTAGE FESTOON STYLED LED LAMP



SECIFICATIONS:

I. Performance:

- For use with Clikstrip and standard profile lamp clips.
- Suitable for Dry locations.
- Easy snap fit in standard festoon lamp spaces.
- Uses Nichia white LED's, total power consumption | Watt.
- Light output: 8 lumens (warm white), 10 lumens (cool white)
- 50,000 hour lamp life
- Other color LED's available, consult factory.
- 2. Lamp Types:
 - Voltages available 1 2VAC and 24 VAC.
- 3. Color Temperature:
 - Warm White: 2900K
 - Cool White: 5000K

Ordering Information:

Catalog Numbers:

WW2A - Warm White LED's 12 VAC CW2A - Cool White LED's 12 VAC WW4A - Warm White LED's 24 VAC CW4A - Cool White LED's 24 VAC

ARDEE LIGHTING INC.

A Subsidiary of JJI Lighting Group, Inc. PO Box 1769, 639 Washburn Switch Rd. Shelby, NC 28151 (704) 482-2811; Fax (800) 275-1544 www.ardeelighting.com E-mail: ardee@jjishelby.com

> 022073 2/17/2006



Ordering information

To specify a complete catalog number, choose one item from the selection available in each module.

XXXX XX X

Series

CPPR Parabolic-shaped, specular finished, linear reflector

Nominal length

CPPR 05-15 0.5 - 1.5 meters in half meter increments

CPPR 01-05 1' - 5' in 1' increments

Unit of measure

CPPR	XX	F	Feet
CPPR	XX	М	Meters

PR Serles

A pre-finished, parabolic-inspired, linear aluminum reflector designed to focus light from festoon or looped lamps either up or down.

- · Formed aluminum sheet, pre-finished specular Alzak inside
- · Outer surface can be painted upon request
- · Available in lengths up to 5 feet
- · Easily field cut or can be supplied in any specified length
- · Use with all Clikstrip series strips, order separately
- · UL/C listed for use with festoon or looped lamps up to 10 watts





HIGH PROFILE CLIKSTRIP

LOW PROFILE CLIKSTRIP

NOTE:

combine PR reflector with other Clikstrip extrusions to provide smooth accent light with festoon lamps.

COLORBLAST 12





Color Kinetics[®] ColorBlast[®] 12 is a Chromacore[®] powered product designed for washing walls with rich, saturated colors and color changing effects. ColorBlast 12 is specifically designed with the needs of lighting designers, architects, and retail window directors in mind. A fully sealed product, ColorBlast 12 is designed for both indoor and outdoor installations. The stylish and rugged die-cast aluminum housing meets or exceeds specifications for use in wet and damp locations. ColorBlast 12 is available with a soft-focus tempered glass lens, or a clear tempered glass lens. The soft-focus lens produces a soft-dge 23° beam of light, while the clear lens offers a 10° beam angle for extended light projection. The housing is also equipped to affix spread lenses, lowers, and other attachments. light projection. The housing is also equipped to affix spread lenses, lowers, and other attachments and is available in either black or white finish. A single 3-wire, 60-foot (18.3 m) power cable, rated for outdoor installations, provides both power and data to the light fixture.

Designed to quickly aim the fixture without the need of special tools, ColorBlast 12 features a locking, industrial-grade constant torque hinge. Set screws and an Allen wrench are included for installations requiring locked positioning. Installation is simple – a pre-assembled mounting base allows for after-installation rotation – eliminating the need for precise junction box positioning. The locking base is positioned easily with a smooth, friction-free rotation of up to 350° of travel. The 110° hinge rotation expands the range of light positioning available. A water-tight seal ensures IP rating and maximum longevity.

ColorBlast 12 can be controlled by a Color Kinetics controller or a third-party controller. Each fixture comes pre-addressed to light number one. Simple effects such as fixed color and color wash, require no additional addressing. Other effects across multiple lights, including Chasing Rainbow or Color Sweep, require further addressing using one of the following Color Kinetics addressing tools: Serial Addressing Software (SAS) or Zapi. For protection from extreme temperatures, ColorBlast 12 has been designed with a temperature monitoring feature. If operating temperatures rise to an unsafe level, a compensation circuit is triggered and ColorBlast 12 operation is interrupted causing the lights to turn dull red. After 30 minutes the lights will auto-cycle and return to full intensity.

COLORBLAST SPECIFICATIONS

	COLOR RANGE	16.7 million (24-bit) additive RGB colors; continuously variable intensity		
	SOURCE	36 High intensity RGB LEDs		
	BEAM ANGLE	23° ground lens, 10° clear lens		
	HOUSING	Die Cast Aluminum in black or white finish		
KINETICS	LENSES	Soft-focus tempered glass or clear tempered glass		
	CONNECTORS	60-foot (18.3 m) Unified power and data cable		
BIN [™]	LISTINGS	UL/C-UL listed, CE		
	COMMUNICATION SPECIFICATIONS			
	DATA INTERFACE	Color Kinetics data interface system		
	CONTROL	Color Kinetics full line of controllers including Light System Manager or other		
		DMX512 (RS485) sources		
	ELECTRICAL SPECIFICATIONS			
	POWER REQUIREMENT	24VDC		
\bigcirc				
: UUus	POWER CONSUMPTION	50W Max. at full intensity (full RGB)		
LISTED	POWER SUPPLY	PDS-150e (ITEM# 109-000008-01); PDS-60 24V (ITEM# 109-000017-XX)		
78GF	ENVIRONMENTAL SPECIFICATIONS			
e, Frosted Lens)	TEMPERATURE RANGE	-40°F to 122°F (-40°C to 50°C) operating temperature		
, Frosted Lens) e, Clear Lens)		-4°F to 122°F (-20°C to 50°C) starting temperature		
, Clear Lens)	PROTECTION RATING	IP66		
lowing patents: U.S. ther patents listed at her patents pending.				
All rights reserved. the Color Kinetics orCast, ColorPlay, , iPlayer, Optibin,	In traditional lamp sources, lifetime is defined as the point at which 50% of the lamps fail. This is also termed Mean traditional lamp sources, lifetime is defined as the point at which so of the lamps fail. This is also termed Mean as, However, MTBF is not the only consideration in determining useful life. Color Kinetics uses the concept of useful light outp			

Video Video

Temperature and effects will affect lifetime. Color Kinetics rates product lifetime using lumen depreciation to 50% of original light output. When the fixture is running at room temperature using a color wash effect, the range of lifetime is in the range of 80,000-100,000 hours. This is IED manufacturers' test data. High output is defined as any IED device that is 1/2 watt or above. For more detailed information on source life, please see www.colorkinetics.com/lifetime.



OPTI BY COLOR K DRY DAMP

CHROMA



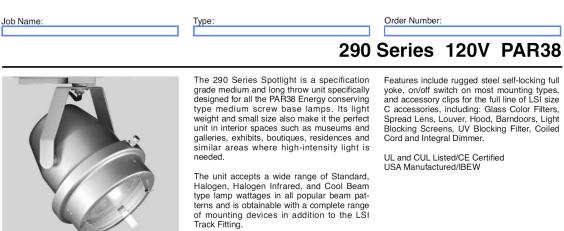
116-000012-00 (White 116-000012-01 (Black, 116-000012-02 (White 116-000012-03 (Black,

oduct is protected by one or more of the follo Patent Nos. 6,016,038, 6,150,774 and oth http://colorkinetics.com/patents/. Othe

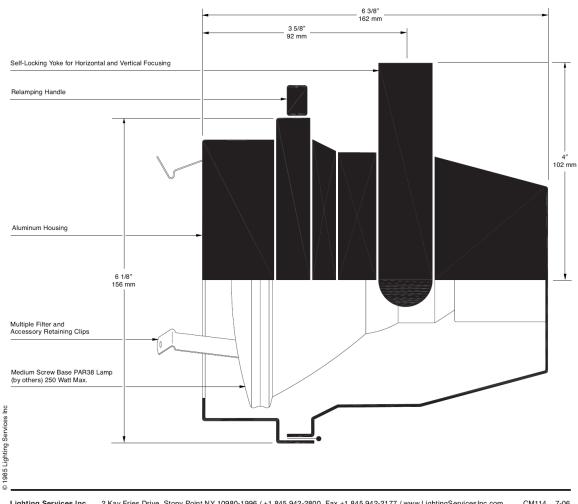
©20052006 Color Kinetics Incorporated. All right reserved. Chromacore, Chromasic, Color Kinetics, the Color Kinetics Ogo, ColorBatt, ColorBart, ColorCa, ColorPlay, ColorScope, Direct Ught, Color, IColor Cove, IPbyer, Optibin Powercore, Quickfay, Sueze, the Source logo, and Smartjuice are registered trademarks and DiMand, Insili/White, Video With Ught and Ught Without Limits are trademarks of Color Kinetics Incorporated

All other brand or product names are trademarks registered trademarks of their respective owners.

Specifications subject to change without notice. Refer to colorkinetics.com for the most recent data sheet versions.



290-00



Lighting Services Inc 2 Kay Fries Drive, Stony Point NY 10980-1996 / +1 845 942-2800 Fax +1 845 942-2177 / www.LightingServicesInc.com CM114 7-06

Job Name:

Type

Order Number:

290 Series 120V PAR38

Photometric Data⁷

16 14

FL SP 29000 6300

7250 1575

3222 700

1813 394

1160 252

806 175

592 129

453 98

358 78

63

52 E 201

44

19

.<u>s</u> 290 ¥ 240

172 37

113 25

80 17

73 16

00 Footcan 22

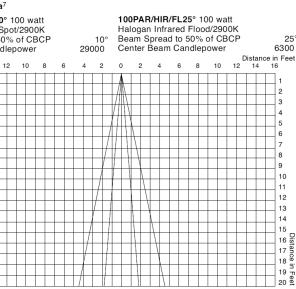
Max.

e e

ò 148 32

ы 3 129 28

100PAR/HIR/SP10° 100 watt Halogen Infrared Spot/2900K Beam Spread to 50% of CBCP Center Beam Candlepower



Ordering Information Model Number add suffix letters for finish

290-00

Lexan Fitting for 1 and 2 circuit LSI Track. With switch 290-00F Same as above, with fuse.

290-2G

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





290-3G

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



Lamp Types

60PAR/HIR/SP10° 60 watt, 3000 hours CBCP 20000 / Color Temperature 2875K

60PAR/HIR/FL30° 60 watt, 3000 hours CBCP 3600 / Color Temperature 2875K

60PAR/HIR/FL40° 60 watt, 3000 hours CBCP 2000 / Color Temperature 2875K

80PAB/HIB/SP10° 80 watt, 3000 hours CBCP 25000 / Color Temperature 2900K

80PAR/HIR/FL25° 80 watt, 3000 hours CBCP 5500 / Color Temperature 2900K

90PAR/H/SP10° 90 watt, 2500 hours CBCP 16000 / Color Temperature 2870K

90PAR/HIR/SP12°/XL 90 watt, 6000 hours CBCP 12000 / Color Temperature 2800K

90PAR/H/FL25° 90 watt, 2500 hours CBCP 4100 / Color Temperature 2870K

90PAR/H/CB/FL25° 90 watt, 2500 hours CBCP 4100 / Color Temperature 2870K

90PAR/HIR/FL40°/XL 90 watt, 6000 hours CBCP 2800 / Color Temperature 2800K

100PAR/HIR/SP10° 100 watt, 3000 hours CBCP 29000 / Color Temperature 2900K

100PAR/HIR/FL25° 100 watt, 3000 hours CBCP 6300 / Color Temperature 2900K

100PAR/HIR/FL40° 100 watt, 3000 hours CBCP 3400 / Color Temperature 2900K

Q250PAR/SP10° 250 watt, 4200 hours CBCP 40000 / Color Temperature 2880K

Q250PAR/FL30° 250 watt, 4200 hours CBCP 9000 / Color Temperature 2880K

Accessories

Louver C

1/2" cellular metal louver, controls spill light and glare, 45° cutoff.

10° X 25 Hood C

3" deep cylindrical hood controls spill light and glare, black interior.

Hood Sparkle C

3" deep cylindrical hood controls spill light and glare, with decorative sparkle effect. Cross Baffle C

2 1/8" deep cylindrical cross baffle hood, controls spill light and glare, black interior. Delta Baffle C

2 1/8" deep cylindrical delta baffle hood, controls spill light and glare, black interior. Barndoor C

4-way individually adjustable blades for control of light beam.

Glass Color Filters, Size C

Selection of 95 permanent rimmed dichroic and rimmed and slotted standard colors. Spread Lens C990

Permanent glass for spreading light beam in one axis, $5^{\circ} \times 50^{\circ}$.

Spread Lens C992

Permanent molded glass lens for spreading light beam in one axis-nominal 5°X 30°.

Spread Lens C995

Permanent molded glass lens for spreading light beam in all directions—nominal 50° X 50°. Spread Lens C996

Permanent molded glass lens for spreading light beam slightly more in one direction than the other-nominal 45° X 50°.

Beam Softener C998 Permanent glass lens for conditioning light

to create a softer beam. OPTIVEX[™] UV Blocking Filter C962

Eliminates ultra-violet wavelengths below 410±10nm. Especially useful for conserva-tion of artworks and to help prevent fading.

Wrench Locking For permanent locking of fixture position, add "WL" to model number.

otes: CBCP = Center Beam Candlepower K = Color Temperature in Kelvin degrees H = Halogen HIR = Halogen Infrared CB = Cool Beam OPTIVEX^m glass is a trademark of Bausch & Lomb Inc. Lamp Manufacturers Published Data on-UL and Non-CUL

2 Kay Fries Drive, Stony Point NY 10980-1996 / +1 845 942-2800 Fax +1 845 942-2177 / www.LightingServicesInc.com Lighting Services Inc CM114 7-06

Cushioned weighted base for floor or table use. With

grounding cord

on standard 4

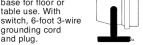
octagonal outlet

Canopy for permanent mounting

and plug.

290-5

boxes.





Light Blocking Screens, Size C C801S-20% Light Blocking, C802S-30% Light Blocking, C803S-40% Light Blocking Stainless Steel Screens. Used individually or in combination to reduce transmitted light without changing its color temperature.

Coiled Cord

18/3 105°C, 18" retracted, 6 foot extended. Specify by adding suffix CC to model number. White fixture supplied with white cord, all other finishes supplied with black cord.

Integral Dimmer

For Yoke Mounted Dimmer add Suffix "FD" to model number.

Finishes	(Paint)
Black	(suffix B)
White	(suffix W)
Silver	(suffix S)
Granhite	(suffix G)

Platinum (suffix P)



* 290-4G

Lamp A7



Product Number: 14311

Order Abbreviation: 100PAR38/CAP/IR/FL40 120V

General Description: Tungsten Halogen CAPSYLITE IR PAR38 Reflector Lamp Medium Skirt Base 100Watt 120Volt Flood Beam

Product Information		
Abbrev. With Packaging Info.	100PAR38CAPIRFL40 120V 12/CS 1/SKU	
Approx. Lumens	2070	
Average Rated Life (hr)	3000	
Base	E26 Medium Skirted	
Beam Angle (deg)	40	
Beam Type	FL	
Bulb	PAR38	
Centerbeam Candlepower (cp)	3400	
Class	C (gas)	
Color Rendering Index (CRI)	100	
Color Temperature/CCT (K)	2900	
Diameter (in)	4.75	
Diameter (mm)	120.65	
Ecologic	NO	
Family Brand Name	CAPSYLITE® IR® PAR38	
Filament	CC-8	
Horizontal Beam Angle (deg)	40	
Maximum Overall Length - MOL (in)	5.313	
Maximum Overall Length - MOL (mm)	134.9375	
Nominal Voltage (V)	120.00	
Nominal Wattage (W)	100.00	
Vertical Beam Angle (deg)	40	

Type:

Job Name:

Preliminary Spec Sheet



The LumeLEX[™] Series is an exciting new line of fixtures featuring the Lexel[™] technology, a universal platform for solid state lighting (SSL). The LumeLEX[™] combines breakthroughs in thermal design, optics and feedback to provide precise color temperature control and dimming. The LumeLEX[™] uses significantly less energy to produce the same amount of light as a conventional light source.

The decidedly contemporary design of the LumeLEX[™] Series makes it perfect for interior spaces such as high end retail, museum and gallery installations, where useful, quality white light is critical.

Order Number:

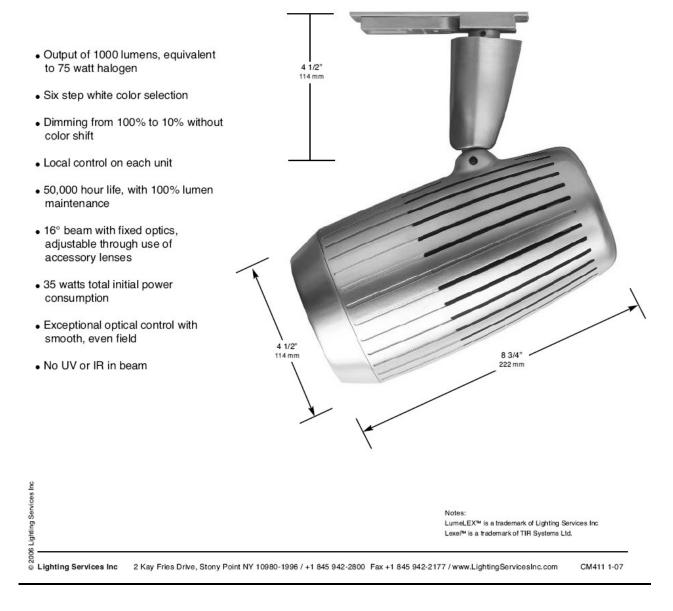
LumeLEX[™] Series

Due to significant advances in thermal management and feedback control, the LumeLEX™ has a life of 50,000 hours. The unit comes equipped with six preset color temperature options: 2700°K, 3000°K, 3500°K, 4000°K, 5000°K and 6500°K, and an on-board dimmer capable of changing output from 100% to 10% without color shift.

All units are adjustable and self-locking in all horizontal and vertical planes and are available with all LSI mounting fittings, in standard LSI Black, White, Silver, Graphite, and Platinum finishes, and a variety of optical accessories.

UL and CUL Listed USA Manufactured /IBEW

LumeLEX™



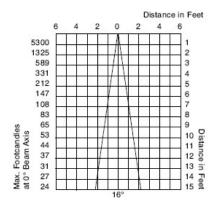
Job Name:

LumeLEX[™] Series

Photometric Data

System Specs

LumeLEX 35watt, 50000 hrs Color Temperature 2700K-6500K, 6 steps Lumens 1000 Beam Spread (Minimum) 16° Center Beam Candlepower 5300



Accessories

Type:

Spread Lens C990

Permanent glass for spreading light beam in one axis, 5° X 50°.

Spread Lens C992

Permanent molded glass lens for spreading light beam in one axis-nominal 5°X 30°.

Spread Lens C995

Permanent molded glass lens for spreading light beam in all directions-nominal 50° X 50°.

Spread Lens C996

Permanent molded glass lens for spreading light beam slightly more in one direction than the other-nominal 45° X 50°.

Louver Hex LX

Hexcell metal louver, controls spill light and glare, 45° cutoff, black finish.

Hood LX

Cylindrical hood, controls spill light and glare, 45° cutoff, black interior.

Preliminary Spec Sheet

Ordering Information Model Number

LX1000-00

for 1 and 2 circuit LSI Track.

With switch.

Lexan Fitting

Order Number:

4 1/2"

LX1000-2G Universal fitting for Unistrut Systems and any screw or bolt-up applications. With switch, 6-foot 3-wire grounding cord and plug.



LX1000-3G C-clamp for pipes from 5/8" to 2" O.D. With switch. 6-foot 3-wire grounding cord and plug.



Configuration

All units come with on-board CCT selection for 6 pre-set color temperatures and dimmer for 100% to 10% output.



LX1000-5A Canopy for permanent mounting on standard 4" octagonal outlet boxes.



Finishes (Paint) Black (suffix B) (suffix W) White Silver (suffix S) Graphite (suffix G) Platinum (suffix P)

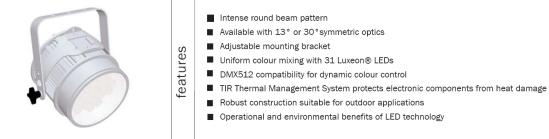
Notes:

1. K = Color Temperature in Kelvin degrees LumeLEX[™] is a trademark of Lighting Services Inc
 Lexel[™] is a trademark of TIR Systems Ltd.

Fixture Type EX1

DESTINY[™] Destiny SP





S	OPTICS	13° or 30° symmetric spot optics
ations	LIGHT SOURCE	31 Luxeon® high flux LEDs
ecificat	DISTRIBUTION	Symmetric round beam projection
rd spe	SETBACK DISTANCE	4 feet to 30 feet
standard	FINISH	Two standard powdercoat finishes: silver or black
st	POWER SUPPLY 100V - 240V auto ranging (90W capable of powering two Destiny SP units) NEMA type 4 enclosure (Hammond 1414N4PHK)	

	DES —	SP —				- DMX
	SERIES	PRODUCT	OPTIC	LED LIGHT COLOUR	FINISH	NETWORK
standard order codes	Destiny™	Destiny SP	13 13° beam angle 30 30° beam angle	RGB 7 red, 12 green, 12 blue RED 31 red GRN 31 green BLU 31 blue ABR 31 amber CWH 31 cool white, 5600K	BLK Black SLR Silver WHT White	DMX



 TIR Systems Ltd.
 1 800 663 2036

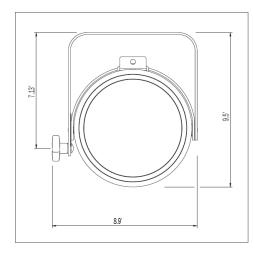
 7700 Riverfront Gate
 T 604 294 8477

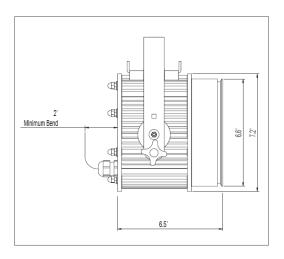
 Burnaby BC
 F 604 294 3733

 Canada V5J 5M4
 www.tirsys.com

 Destiry SP_Version 1_Imp_07 July 2005 Page 1

	ical	HOUSING	Extruded aluminum								
	mechanical	MOUNTING	Cast iron yoke allows mounting with standard C-clamp or surface mountir Permanent or adjustable locking mechanism								
S		MAXIMUM INPUT POWER	MODEL	OUTPUT COLOUR (ON FULL)	LUMINAIRE INPUT POWER						
technical specifications	rical		RGB RGB RGB RGB Single color option	Red Green Blue White Red, Green, Blue Amber, White	8 W 13.5 W 13.5 W 35 W 35 W						
technical s	electrical	CONNECTIONS	Separate power and data Power (enclosure): standard 110/220/240 Power (luminaire): +24V DC, GND Data: Individually shielded 18AWG for input and output DMX								
		TEMPERATURE RANGE	-40°F to 104°F operating temperature -4°F to 104°F starting temperature								
	Ital	CERTIFICATION	CUL / UL / CE								
	environmental	INGRESS PROTECTION	IP66								







 TIR Systems Ltd.
 1 800 663 2036

 7700 Riverfront Gate
 T 604 294 8477

 Burnaby BC
 F 604 294 3733

 Canada V51 5M4
 www.ttrsys.com

 Destiny SP_Version 1_Imp_07 July 2005 Page 2

Throw														
Dista	nce (1	feet)	8'	SETBAC	ж					20	SETBA	СК		
4.0	0.2	0.4	0.5	0.6	0.5	0.4	0.2	1.1	1.5	1.9	2.1	1.9	1.5	1.1
3.0	0.5	0.9	1.5	1.8	1.5	0.9	0.5	1.9	2.8	3.7	4.1	3.7	2.8	1.9
2.0	0.9	2.2	4.7	6.5	4.7	2.2	0.9	2.9	4.8	6.9	7.8	6.9	4.8	2.9
1.0	1.4	4.8	18.7	36.5	18.7	4.8	1.4	3.8	6.9	10.2	11.8	10.2	6.9	3.8
0.0	1.7	7.1	36.4	82.9	36.4	7.1	1.7	4.2	7.8	11.7	13.3	11.7	7.8	4.2
-1.0	1.4	4.8	18.7	36.5	18.7	4.8	1.4	3.8	6.9	10.2	11.8	10.2	6.9	3.8
-2.0	0.9	2.2	4.7	6.5	4.7	2.2	0.9	2.9	4.8	6.9	7.8	6.9	4.8	2.9
-3.0	0.5	0.9	1.5	1.8	1.5	0.9	0.5	1.9	2.8	3.7	4.1	3.7	2.8	1.9
-4.0	0.2	0.4	0.5	0.6	0.5	0.4	0.2	1.1	1.5	1.9	2.1	1.9	1.5	1.1
	-3'	-2'	-1'	0	+1'	+2'	+3'	-3'	-2'	-1'	0	+1'	+2'	+3'

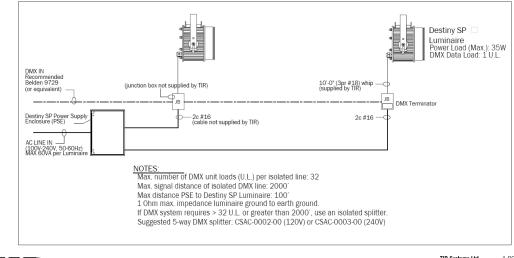
=	Throw Vertical Illuminance (fc)														
	Dista	nce (1	feet)	4' SETBACK						8'	SETBAC	ж			
2	4.0	0.3	0.5	0.7	0.7	0.7	0.5	0.3	1.0	1.4	1.8	1.9	1.8	1.4	1.0
	3.0	0.6	1.1	1.8	2.2	1.8	1.1	0.6	1.6	2.5	3.5	3.9	3.5	2.5	1.6
	2.0	1.1	2.5	5.6	7.8	5.6	2.5	1.1	2.5	4.3	6.4	7.5	6.4	4.3	2.5
5	1.0	1.7	5.4	17.2	30.1	17.2	5.4	1.7	3.4	6.4	10.2	12.1	10.2	6.4	3.4
	0.0	2.0	7.4	29.7	57.6	29.7	7.4	2.0	3.8	7.4	12.1	14.4	12.1	7.4	3.8
	-1.0	1.7	5.4	17.2	30.1	17.2	5.4	1.7	3.4	6.4	10.2	12.1	10.2	6.4	3.4
2	-2.0	1.1	2.5	5.6	7.8	5.6	2.5	1.1	2.5	4.3	6.4	7.5	6.4	4.3	2.5
	-3.0	0.6	1.1	1.8	2.2	1.8	1.1	0.6	1.6	2.5	3.5	3.9	3.5	2.5	1.6
	-4.0	0.3	0.5	0.7	0.7	0.7	0.5	0.3	1.0	1.4	1.8	1.9	1.8	1.4	1.0
		-3'	-2'	-1'	0	+1'	+2'	+3'	-3'	-2'	-1'	0	+1'	+2'	+3'

Γ

IR

R

り act to change. For up to date product information, please log on to www.tirsys.com



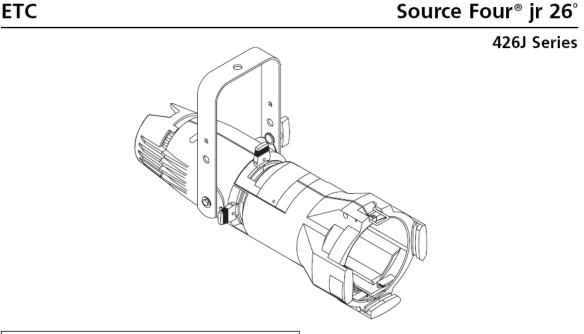
 TIR Systems Ltd.
 1 800 663 2036

 7700 Riverfront Gate
 T 604 294 8477

 Burnaby BC
 F 604 294 3733

 Canada V5J 5MA
 www.tirsys.com

 Destiny SP_Version 1_Imp_07 July 2005 Page 3



SPECIFICATIONS

Ellipsoidal lighting fixture

PHYSICAL Die cast aluminum construction

20 gauge stainless steel shutters in a bi-plane assembly Interchangeable lens tubes with smooth–running teflon guides provide six user-fit field angle options High impact, thermally insulated knobs and shutter handles

Two accessory slots, and a top mounted, gel frame retainer

Steel yoke with two mounting positions

Positive locking, hand-operated yoke clutch

Slot for stainless steel patterns

Slot with sliding cover for motorized pattern devices or optional iris

UL and cUL listed

ELECTRICAL115-240V, 50/60Hz

High temperature 3–conductor 36" leads in a glass fiber outer sleeve Supports ETC Dimmer Doubling™ technology

LAMP HPL – compact tungsten filament contained in a krypton-filled quartz envelope (see table for suitable lamp types) 575W Maximum

OPTICAL Precision molded borosilicate ellipsoidal reflector with aspheric lens and multi-layer dichroic coating Interchangeable lens mount assemblies allow userinstallation of different lens types

Reflector secured with anti-vibration shock mounts Lens(es) secured with anti-vibration shock mounts 95% of visible light reflected through the optical train 90% of infrared radiation (heat) passes through the reflector

Tool free lamp centering (X/Y) and peak/flat (Z) adjustment knobs

Positive locking X, Y and Z adjustments, unaffected by relamping

Interchangeable lens assembly kits permit selection of 26°, 36°, and 50° field angles, and 25°-50° zoom range

ORDERING INFORMATION

Source Four jr

Model#	Description
426J	26° Source Four jr (black)
426J-1	26° Source Four jr (white)
ETC Source	Four jr are supplied with C-clamp, color frame

and 3' (96cm) leads as standard

Connector Designation

Use Suffixes below to specify Factory–Fitted Connector type

Model#	Description
A	Parallel-blade U-ground connector
В	Two-pin and ground, 20 amp connector
С	Grounded, 20 amp, twistlock connector
м	Dimmer Doubling™ Connector (NEMA L515P)

Source Four jr Accessories

Model#	Description
426JL	Source Four jr 26° lens assembly
400SC	Safety cable
400CC	C–clamp (included)
400JRS	Drop–in iris
400CF	Colorframe (6.25") (included)
400DN	Donut (6.25")
400TH	Top hat
400HH	Half hat
400GE	Gel Extender
400PH-M	Pattern holder (M size)

Note: For colors other than black and white, please call ETC.

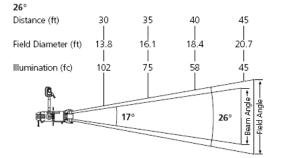


Source Four® jr 26°

426J Series

PHOTOMETRIC

All photometric data in this document was prepared using standard production fixtures, and the PrometricTM CCD measurement system. Fixtures were adjusted for cosine distribution, and were tested with a calibrated HPL 575/115V 16,520 lumens lamp at its rated voltage. All data were normalized to nominal lamp lumens.



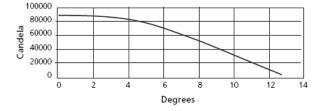
For illumination with any lamp, multiply the candlepower of a beam spread by the multiplying factor (mf) shown for that lamp.

To determine illumination in footcandles or lux at any throw distance, divide candlepower by distance squared.

For Field diameter at any distance, multiply distance by .46

For Beam diameter at any distance, multiply distance by .30

Metric Conversions: For Meters multiply feet by .3048 For Lux multiply footcandles by 10.76



Candlepower Distribution Curve Cosine

Source Four jr 26° (cosine)

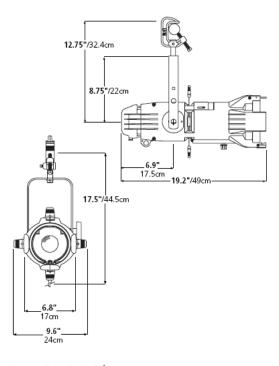
Degree	Candlepower	Field Lumens	Efficacy	Efficiency
26°	92,000	7,312	12.7 LPW	44.3%

PHYSICAL

			Initial	Color	Average	
Lamp code	Watts	Volts	Lumens	Temp.	Rated Life	MF
HPL 575/115	575	115	16,520	3,250°	300	1.00
HPL 575/115X	575	115	12,360	3,050°	2000	0.76
HPL 575/120	575	120	16,460	3,250°	300	1.00
HPL 375/115	375	115	10,540	3,250°	300	0.63
HPL 375/115X	375	115	8,060	3,050°	1000	0.49
HPL 550/77*	550	77	16,170	3,250°	300	1.00
HPL 550/77X*	550	77	12,160	3,050°	2000	0.76
HPL 575/230	575	230	14,900	3,200°	300	0.87
HPL 575/240	575	240	14,900	3,200°	300	0.87
HPL 575/230X	575	230	11,780	3,050°	1500	0.70
HPL 575/240X	575	240	11,780	3,050°	1500	0.74
HPL 375/230X	375	230	7,800	3,050°	1000	0.47
HPL 375/240X	375	240	7,800	3,050°	1000	0.47

*77V lamps are intended for use with the ETC Dimmer Doubler™.

Warning: Use of lamps other than HPL will void UL/cUL safety approval and product warranty. Source Four jr is rated for 575W maximum.



Source Four jr Weights

Model	Fixture	Weight*	Shipping Weight					
	lbs kgs		lbs	kgs				
26°	10	10 4.5		7.5				
* Add 2.3 lbs for C-clamp								



Corporate Headquarters = 3031 Pleasant View Rd, PO Box 620979, Middleton WI 53562 0979 USA = Tel +1 608 831 4116 = Fax +1 608 836 1736 London, UK = Unit 26-28, Victoria Industrial Estate, Victoria Road, London W3 6UU, UK = Tel +44 (0)20 8896 1000 = Fax +44 (0)20 8896 2000 Rome, T = Via Ennio Quirino Visconti, 11, 00193 Rome, Italy = Tel +39 (06) 32 111 683 = Fax +39 (06) 32 656 90 Holzkirchen, DE = Ohmstrasse 3, 83607 Holzkirchen, Germany = Tel +49 (80 24) 47 00-0 = Fax +49 (80 24) 47 00-3 00 Hong Kong = Room 605-606, Tower III Enterprise Square, 9 Sheung Yuet Road, Kowloon Bay, Kowloon, Hong Kong = Tel +852 2799 1220 = Fax +852 2799 9325 Web = www.etconnect.com = copyrighte 2006 ETC. All Rights Reserved. All product information and specifications subject to change. 70621.007 Rev. D Printed in USA 0706 Source Four[®] products protected by U.S. Patent Number 5,266,613, 5,345,371, 5,54028, 5,4426,537 and 5,775,798. Japanee Fatent Number 2,501,772; US and International Patents Pending.



EDLT

Enhanced Definition Lens Tube — Option for Source Four fixture body. Provides high contrast, crisp gobo projection imaging.



Applicable Product	Catalog #	Part #
Source Four	419EDLT	7060A2046
Source Four	426EDLT	7060A2047
Source Four	436EDLT	7060A2048
Source Four	450EDLT	7060A2049

DROP IN IRIS

Applicable Product	Catalog #	Part #
5°-90° Source Four	400RS	7060A1012
Source Four jr	400JRS	7062A1011



PATTERN HOLDERS



	Applicable Product	Dimensions		Catalog #	Part #
	A size for 5°-90° Source Four	X = 3.25"	Y = 3.75"	400PH-A	7060A1013
	B size for 5°-90° Source Four	X = 2.75"	Y = 3.75"	400PH-B	7060A1014
	Glass for 5°-90° Source Four	X = 2.75"	Y = 3.75"	400PH-G	7060A1019
	M size for Source Four jr	X = 2.12"	Y = 2.75"	400JPH-M	7062A1010

Lamp EX2

Product Number: 54649

Order Abbreviation: HPL 375/115/X (UCF)

General Description: 375 watt, tungsten halogen, HPL series, long life

Product Information					
Abbrev. With Packaging Info.	HPL375115X (UCF)115V 12/CS 1/SKU				
Application	Stage & Studio				
Average Rated Life (hr)	1000				
Base	Medium Bipin with Heat Sink				
Bulb	Т8				
Class	C (gas)				
Color Rendering Index (CRI)	100				
Color Temperature (K)	2950				
Diameter d (in)	0.741				
Diameter d (mm)	19				
Distance a (in)	2.352				
Distance a (mm)	60.3				
Family Brand Name	HPL				
Filament	4-C8				
Lamp Finish	Clear				
Length I (in)	3.822				
Length I (mm)	98				
Length I max. (in)	3.822				
Length I max. (mm)	98				
Light Center Length - LCL (in)	2.352				
Light Center Length - LCL (mm)	60.3				
Luminous Flux (Im)	8000				
Maximum Overall Length - MOL (in)	3.822				
Maximum Overall Length - MOL (mm)	98				
Nominal Voltage (V)	115.00				
Nominal Wattage (W)	375.00				
Operating Position	Any				
Type of Current	AC				



Fixture Type EX2A





ARCADIA 17 Richard Nelson













CRAZED







POP TOP

olmes



FLOATING SQUARES David Davidian



DRY STONE WALL 2

BASKET WEAVE

Kirk Book

SPLINTERS Dennis Parichy



7563 GLASS BRICK

7952 TILES

7527 BRICKS



Abiga



URBAN BREAKUP

Richard Nelson









ELLIPSES



CANE

IRREGULAR DOTS



BUBBLES SMALL Mitel

DOT BREAKUP (LG)



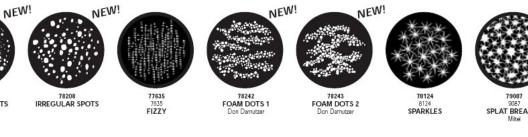
DOT BREAKUP (MED)



FOAM



DOT BREAKUP (SM)



WEB LINK TO VIEW See more designs for this category on the Rosco website: MORE DESIGNS http://www.rosco.com/gobos/abstract

SPLAT BREAKUP

SMALL SQUARES

CHESSBOARD

CHEQUERED FLAG 3

ELLIPSE 1





∩∎sco

			Ar	mage ea (IA)	ST	EEL		GL	ASS	S	PECTRU	MGOBOS	***
SIZE	STEEL SIZE LETTEI CODE	R FIXTURE TYPE/GOBO SIZE		Diam Diam OD) ETER (mm) IA	STANDARD STEEL	CUSTOM STEEL	SILK SCREEN GLASS	COLORIZERS"	PRISMATICS ^{m11} IMAGE GLASS ^{m11} COLORWAVES ¹¹¹ (All require Iris Slot Gobo Hodder)	SIGNATURE SERIES	BLACK AND WHITE	ONE COLOR	TWO COLOR, MULTI-COLOR (Requires Iris Sot Holder)
1000	А	A Size	100	75	Х	Х	Х				Х	Х	Х
0860	В	B Size	86	64.5	Х	Х	Х	Х	х	Х	Х	Х	Х
0790	BG	BSize Glass (Obsolete)*	79	64.5	0	0	0	0	0	Х	0	0	0
0660	М	M Size (S4 Jr.)	66	49.5	Х	Х					Х	х	P
0533	D	D Size (Steel)	53.3	40	Х	Х					Х	Х	
0518		Clay Paky Stage Scan, Zoom	51.8	48		Х		0	0	х	Х	Х	X
0495		Martin PAL 1200	49.5	38		Х		0	0	Х	Х	Х	Х
0445	СҮВ	HES Cyberlight	44.25	38	Х	Х		0	0	х	Х	х	X
0375	E	E Size	37.5	28	Х	Х		0	0	Х	Х	Х	Х
0363		HES Studiospot 575	36.3	31.5	0	Х				0	Х	х	X
0315		Clay Paky VIP	31.5	23	0	Х				0	Х	Х	X
0278	MAC	Martin Mac 500, 918	27.8	23	Х	Х				0	Х	х	X
0215		Martin MAC 250	22.25	17	0	Х				0	Х	Х	Х
2514	M518	Martin 518	25	14	Х	Х				0	Х	х	X
0250	V	HES Technobeam, Studiospot 250	25	22-20	X**	Х				0	Х	Х	X
0250	V	CP Mini-Scan HPE, Stagelight 300	25	22-20	Х**	х				0	х	х	X
0250	V	Trackspot	25	18	Х	Х				0	Х	Х	
0250	V	HES Intellibeam (Steel)	25	18	Х	Х				0		0	
2039		HES Intellibeam (Glass)	29	18							Х	Х	
0250	V	Vari*Lite VL1	25	18	Х	Х						х	X
2039	VL2/6	Vari*Lite VL2	SPEC	SPEC	Х	Х						Х	Х
2039	VL2/6	Vari*Lite VL6	SPEC	SPEC	х	Х						Х	X
2039		Vari*Lite VL7			0	Х					х	Х	
6699		Generic Custom 66-99MM O.D.	VAR	VAR		Х					Х	Х	P
4065		Generic Custom 40-65MM O.D.	VAR	VAR		Х					Х	Х	Р
2039		Generic Custom 20-39MM O.D.	VAR	VAR		Х					х	Х	P
KEY:	0	 Available Available by special order. Contact R Possible. Requires sizing ring. Contact 							 Image Area reduced to Maximum wattage is 250 Maximum wattage is 100 	0W at 208V	-	-	<u>.</u>

P – Possible. Requires sizing ring. Contact Rosco for details.
 BG Size (obsolete) glass gobos require Effects Adapters (No. 50000) for use in Rosco Gobo Rotators

Maximum wattage is 1000W at 120V, 1250W at 220V
 Aximum wattage is 600W for Lekos, 1200W for moving lights.

For the latest list of gobo sizes and compatibility information, check the Rosco web site at: http://www.rosco.com/gobocatalog/support/lixtures.html

L etter Size A 3 M	O.D. 100mm 86mm 66mm	I.A. 75mm 64.5mm	Size B BG	O.D. 86mm	I.A./BW 64.5mm	I.A./MC 59mm
3 M	86mm	64.5mm	-		64.5mm	59mm
			BG			
	66mm		20	79mm	64.5mm	59mm
		49.5mm	M	66mm	49.5mm	39mm
D	53.3mm	48mm	Clay Paky HPE	51.8mm	48mm	39mm
Cyber 4	44.25mm	38mm	Martin PAL	49.5mm	38mm	31.mm
<u> </u>	37.5mm	28mm	Cyber	44.25mm	38mm	31mm
Mac 500	27.8mm	23mm	Mac 2000	37.5mm	28mm	22mm
/	25.5mm	18mm	Studio Spot 575	36.3mm	31.5mm	22mm
			Mac 500	27.8mm	23mm	17mm
			V	25.5mm	18mm	16mm
			Mac250	22.5mm	18mm	14mm

Fixture Type EX3

FLATBACK CYLINDERS - LINE VOLTAGE & LOW VOLTAGE

PRODUCT HIGHLIGHTS

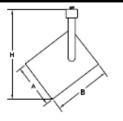
FB

- Variety of sizes for use with A-lamps, PAR lamps, reflector lamps and MR-16 miniature (low voltage) lamps.
- · Traditional flatback cylinder styling.
- · Recessed lamp position provides excellent lamp shielding cutoff.
- On / Off switch for simple fixture control and ease of relamping.
- Available in white or black cylinder finish with black baffle.
- Low voltage units and large PAR38 fotures come with yoke mounting. PAR20 and PAR30 units are stem-mounted
- · Low voltage units include transformer built into housing.
- CONSTRUCTION Cylinder constructed of high quality drawn steel. Yoke stamped from #16 C.R.S. Polyester powder coat paint finish.
- ADAPTER / STEM Polycarbonate. Two-position 'hot' contact allows use with either one or two circuit track. Thumb slide-lock provides secure connection to track.
- AIMING Finger screw-lock for precise aiming. 355-degree rotation capability.
- LISTING UL listed to U.S. and Canadian safety standards for use with LSI one and two circuit track.





DIMENSIONS



Fixiure	Diameter (A)	Leng i h (B)	Max. Height (H)
PAR20	3 1/2*	6 1/8"	9 1/2°
PAR30	4 1/2*	7 1/8*	11 1/4"
PAR38	5 3/4°	8 1/8"	12 1/2*
MR16	3 1/2*	6"	6 1/4"

FIXTURE ORDERING INFORMATION

Head Style	Light Source	Color	
Line Voltage FB	20 - PAR20 (50w max) or R20 (75w max) 30 - PAR30 (75w max) or BR30 (65w max) 38 - PAR38 (250w max) or BR40 (120w max)	W - White B - Black	
Low Voltage FBL	16 - MR16 (50w max)		
FB	30	Ŵ	

ACCESSORY INFORMATION (Order Separately) Choose the accessory that corresponds with your lamp type

Lamp Reference	Holder	Barn Doors	Lowar
PAR20	AH-20	BD-20	L-20
PAR30	AH-30	BD-30	L-30
PAR38	AH-38	BD-38	L-38
MR16	AH-20	BD-20	L-20

Project Name______ Fixture Type ______ © 2006 LSI INDUSTRIES INC.

Lamp EX3



Order Abbreviation: 50PAR30/CAP/IR/NFL25 120V

General Description: Tungsten Halogen CAPSYLITE IR PAR30 Reflector Lamp Medium Base 50Watt 120Volt Narrow

Product Information					
Abbrev. With Packaging Info.	50PAR30CAPIRNFL25 120V 15/CS 1/SKU				
Approx. Lumens	900				
Average Rated Life (hr)	3000				
Base	E26 Medium				
Beam Angle (deg)	25				
Beam Type	NFL				
Bulb	PAR30				
Centerbeam Candlepower (cp)	2900				
Class	C (gas)				
Color Rendering Index (CRI)	100				
Color Temperature/CCT (K)	2825				
Diameter (in)	3.75				
Diameter (mm)	95.25				
Ecologic	YES				
Family Brand Name	CAPSYLITE® IR® PAR30				
Filament	CC-8				
Horizontal Beam Angle (deg)	25				
Maximum Overall Length - MOL (in)	3.625				
Maximum Overall Length - MOL (mm)	92.075				
Nominal Voltage (V)	120.00				
Nominal Wattage (W)	50.00				
Vertical Beam Angle (deg)	25				

Fixture Type C1

ROCKET I INDUSTRIAL OPEN LOWBAY



TYPE:		PI	ROJECT:	
ORDER N	UMBER:			
Model#	Lamp Qty.	Wattage	Ballast	Options
7713	1, 2, 3	26-42 CF	UE, SS	D2, D4, D5, EM
	1, 2	57 CF		CM 1
7713	1 I	70,100 MH	MH1, MH2	Q1, Q2
	1	150мн		
7713	1	INC150W		
	1	85 QL	QL1 120V or	



COMPACT FLUORESCENT

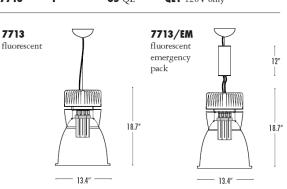
Housing is .063 spun matte anodized aluminum. Canopy mounts to standard J-boxes; suspends from aircraft cables with push button gliders; and supplied with 6 foot power cord. Order **CM1** pipe mount for outdoors. Sockets and ballasts operate 26, 32 and 42 watt triple tubes; voltage is 120 thru 277V. Separate switching **SS**, dimming ballasts **D**and emergency battery pack **EM** Voltage must be specified. U.L. listed for damp locations.

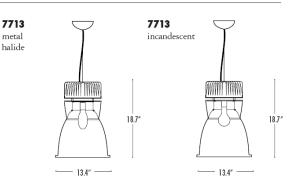
METAL HALIDE/ INCANDESCENT

Housing is .063 spun matte anodized aluminum. Canopy mounts to standard J-boxes; suspends from aircraft cables with push button gliders; and supplied with 6 foot power cord. Incanclescent 150W max. Metal halide ballasts are electronic, for use with medium base, ceramic arc tube lamps rated for open fixtures. For quartz restrike, order **Q1** for 120V and **Q2** for 277V. U.L. listed for damp locations.

QL INDUCTION

Housing is .063 spun matte anodized aluminum. Canopy mounts to standard J-boxes; suspends from aircraft cables with push button gliders; and supplied with 6 foot power cord. The HF generator is electronic component connected to a discharge vessel via a shielded triaxial cable and supplied standard in 120V only for the 85W lamp. U.L. listed for damp locations.





7713 QL induction

BURBANK,

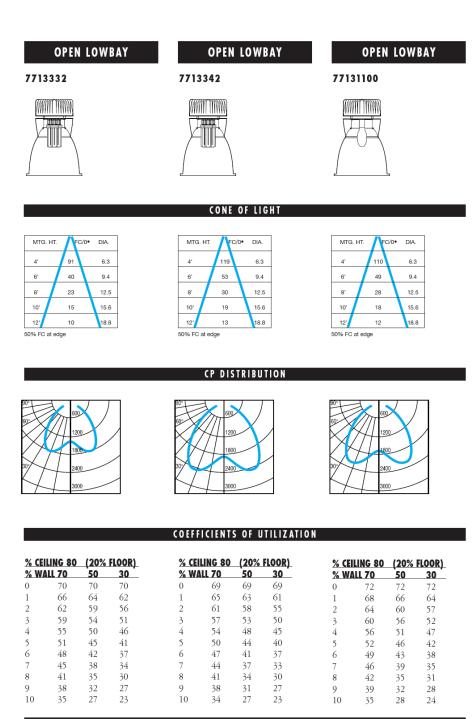
- CALIFORNIA,
- 91505

WWW.

DELRAY

LIGHTING.

COM



7713332

3-32 watt triple tube G24q-3 socket Total lumens-7200 Spacing criteria-1.4

NOTES

7713342 3-42 watt triple tube G24q-4 socket Total lumens-9600 Spacing criteria-1.4 **77131100** 1-100 watt ED17 medium base socket Total lumens-6800 Spacing criteria-1.4

BALLASTS

FLUORESCENT BALLASTS

UE Universal electronic wattage: 26, 32 and 42 voltage: 120 thru 277 All UE and SS models have sockets and ballasts that operate 26, 32 and 42 watt lamps.

SS Separate switching for 3 lamps

DIMMING NOTES:

Due to different operating temperatures, please review number of lamps that can be used per manufacturers ballast before ordering dimming.

DIMMING BALLASTS

D3 Advance Mark X wattage: 1,2or 3-26,32,42 or 1-57 voltage: 120 or 277 voltage must be specified range: 5% - 100% control wires: none dimmers: standard incandescent recommended Advance C500A

D4 Lutron Tu-Wire

Scene control dimming wattage: 1-32, 2-32, voltage: 120 only range: 5% - 100% control wires: none dimmers: Lutron Grafik Eye, Nova T, Diva, Skylark

D5 Advance Mark VII wattage: 1,2or 3-26,32,42 or 1-57,70

voltage: 120 or 277 voltage must be specified range: 5% - 100% control wires: 2 low voltage dimmers: 1-10V analog

METAL HALIDE BALLASTS

MH.1 120V electronic MH.2 277V electronic Metal Halide Ballasts are electronic, square wave type for use with ceramic arc tube, color corrected lamps rated for open and enclosed fixtures.

EXTERIOR LOCATIONS

For suspending out side or for any windy location that could cause oscillation, you must order the pipe mount option. Pipe is 7/8" O.D. and is mounted to an earthquake canopy. Pipe replaces power cord and cable. Length of pipe must be specified.

CM1 pipe mount

Lamp Type C1



Product Number: 20871

 Order Abbreviation:
 CF42DT/E/IN/835/ECO

 General Description:
 DULUX 42W triple comp with electronic and dim

DULUX 42W triple compact fluorescent amalgam lamp with 4-pin base, integral EOL, 3500K color temperature, 82 CRI, for with electronic and dimming ballasts, ECOLOGIC

Product Information							
Abbrev. With Packaging Info.	CF42DTEIN835ECO 50/CS 1/SKU						
Average Rated Life (hr)	12000						
Base	GX24Q-4						
Bulb	Т (Т4)						
Color Rendering Index (CRI)	82						
Color Temperature/CCT (K)	3500						
Family Brand Name	Dulux® EL						
Initial Lumens at 25C	3104						
Mean Lumens at 25C	2670						
Maximum Overall Length - MOL (in)	6.5						
Maximum Overall Length - MOL (mm)	163						
NEMA Generic Designation (current)	CFTR/42W/GX24Q/835						
Nominal Wattage (W)	42.00						

Additional Product Information
Product Documents, Graphs, and Images
Compatible Ballast
Packaging Information

Ballast C1



Electrical Specifications

IZT-2T42-M3-BS@120							
Brand Name	MARK 7 0-10V						
Ballast Type	Electronic Dimming						
Starting Method	Programmed Start						
Lamp Connection	Series						
Input Voltage	120-277						
Input Frequency	50/60 HZ						
Status	Active						

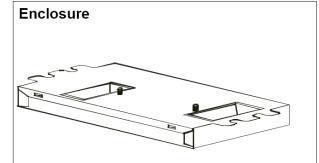
Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (Watts) (min/max)	Ballast Factor (min/max)	MAX THD %	Power Factor	Lamp Current Crest Factor	B.E.F.
CFM32W/GX24Q	2	32	50/10	0.63	19/75	0.05/1.00	10	0.99	1.4	1.33
* CFM42W/GX24Q	2	42	50/10	0.82	18/98	0.05/1.00	10	0.99	1.4	1.02
CFTR57W/GX24C	1	57	50/10	0.55	18/66	0.05/1.00	10	0.99	1.7	1.52
CFTR70W/GX24C	1	70	50/10	0.67	18/80	0.05/1.00	10	0.99	1.7	1.25



the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

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



Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
6.28 "	3.00 "	1.29 "	2.00 "
6 7/25	3	1 29/100	2
16 cm	7.6 cm	3.3 cm	5.1 cm

Revised 08/27/2003



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

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



Electrical Specifications

IZT-1T42-M2-BS@120

Brand Name	MARK 7 0-10V
Ballast Type	Electronic Dimming
Starting Method	Programmed Start
Lamp Connection	Series
Input Voltage	120-277
Input Frequency	50/60HZ
Status	Active

Input Power Lamp Type Num. Rated Min. Input Ballast Factor MAX Power Lamp B.E.F. of Lamp Start Current (Watts) (min/max) THD Factor Current Lamp Watts Temp (Amps) (min/max) % **Crest Factor** (°F/C) s CFM26W/GX24Q 1 26 50/10 0.25 08/29 0.05/1.00 14 0.95 1.4 3.45 CFM32W/GX24Q 50/10 0.33 09/39 0.05/1.00 2.56 1 32 10 0.97 1.4 * CFM42W/GX24Q 50/10 0.42 09/50 0.05/1.00 10 0.98 1.4 2.00 1 42 CFQ26W/G24Q 08/29 1 26 50/10 0.25 0.05/1.00 14 0.95 1.4 3.45

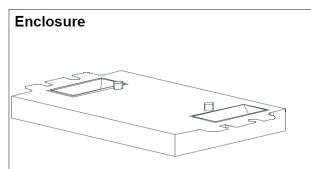


Green Terminal must be Grounded

The wiring diagram that appears above is for the lamp type denoted by the asterisk $({}^{\ast})$

Standard Lead Length (inches)

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



Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
4.98 "	3.00 "	1.29 "	2.00 "
4 49/50	3	1 29/100	2
12.6 cm	7.6 cm	3.3 cm	5.1 cm

Revised 06/18/2003

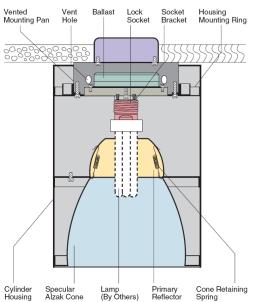


Data is based upon tests performed by Advance Transformer in a controlled environment and representative of relative performance. Actual performance can vary depending on operating conditions. Specifications are subject to change without notice. All specifications are nominal unless otherwise noted.

ADVANCE

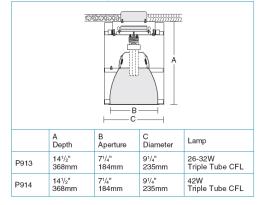
O'HARE INTERNATIONAL CENTER · 10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018 Customer Support/Technical Service: Phone: 800-372-3331 · Fax: 630-307-3071 Corporate Offices: Phone: 800-322-2086

Fixture Type C2





Dimensions and Lamps



P913 One 26-32W Triple Tube Lamp **P914** One 42W Triple Tube Lamp

Surface Mount Cylinder 7¹/₄" Conoid Apertures

Optics and Applications

The two element optical systems have computer designed primary reflectors and parabolic low brightness shielding cones. Distribution from a single vertically mounted triple tube lamp is for general and task lighting. Spacing to mounting height ratios range from .76 to .97 depending upon which lamp is mounted. Use in corridors, entries, over work stations, or for open area lighting.

Design Features

Twist and lock sockets prevent the lamps from falling if not properly engaged. They are a dependable fail-safe mechanism to prevent litigation.

Finish

Specular clear Alzak cones are standard. Optional colors and Softglow® finishes are available. Interiors are optical matte black, the exterior is matte white baked enamel.

Ballasts

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

General

Fixtures are UL and C-UL listed for thermal and electrical safety. Union made IBEW. Luminaire Efficiency Rating (LER) data is in the photometric directory located in Section Z.

CC

Ρ5

ES

WT White trim flange.

WHT White complete trim.

BA Brushed aluminum.

Custom color.

Extra stem length,

Pendant adaptor, 21" length.

Accessories G

- Gold cone.
- Н Mocha cone.
- Graphite cone. Ρ
- Titanium cone. т
- W Wheat cone.
- Pewter cone. Υ
- Bronze cone. Ζ

Μ

S

- specify length.
- Wall or column mount. V347 347 volt ballast.
- Softglow® finishes: add S before color letters. e.g. SW
- for Softglow® wheat cone, SC for Softglow® clear cone. DM Dimming ballast, contact the factory.
- Emergency power. Includes battery pack, charger light, ΕM test switch and single lamp operation for 90 minutes.
- Components are remote from fixture. Specify volts. WRL Wattage restriction label, specify wattage.

Matching Units

Recessed cross baffled Recessed downlights Recessed wall washers

Page P24 Pages P53, P54, P55 Pages P64, P65, P66

** Click for link to pages in blue.



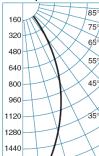
P4

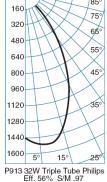
P41 P913 P914

Performance Datachart

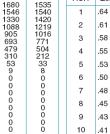
				•							
Single Unit Initial Footcandles, 30" Work Plane Ceiling to Floor Multiple Units Initial Footcandles				candles, 30"	Work Plane						
P913 One 3 P914 One 4								Ceiling 80%	% Walls 509	% Floor 20	%
Nadir	1	10°	2	20°	3	30°		Spacing is Maximum Over Work Plane			ane
FC	FC	Diam	FC	Diam	FC	Diam		Spacing	RCR 1	RCR 3	RCR 8
55 73	49 65	2' 2'	30 39	4' 4'	15 19	<mark>6'</mark> 6'	8'	4' 4'	78 112	68 97	50 71
<mark>29</mark> 39	26 35	3' 3'	16 21	5' 5'	8 10	9' 9'	10'	6' 6'	42 60	36 52	27 38
18 25	16 22	3' 3'	10 13	7' 7'	5 6	11' 11'	12'	7' 7'	26 37	23 33	17 24
13 17	11 15	4' 4'	7 9	8' 8'	3 4	13' 13'	14'	9' 9'	18 26	16 22	11 16
9 12	8 11	5' 5'	5 6	10' 10'	23	16' 16'	16'	11' 10'	13 19	11 16	8 12

Candlepower Distribution





$\begin{array}{c c c c c c c c c c c c c c c c c c c $		Can	delas	
5 0 1657 1421 5 1680 1535 10 1546 1540 15 1330 1420 25 905 1016 25 905 1016 15 905 1016 15 479 504 40 310 212 45 53 33	35°		O 32W	P 32W
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	75°	0	2400*	2400*
	5° 55° 15°	10 15 20 25 30 35 40 45 50 55 60 65 70 75 80	1680 1546 1330 1088 905 693 479 310	1535 1540 1420 1219 1016 771 504 212 33 8



Ceiling	ing 80% 70% 50%		30%		0						
Wall %	70	50	30	10	50	10	50	10	50	10	0
RCR	Zor	nal Ca	avity	Meth	od - F	loor	Refle	ctan	ce 20	%	
1	.64	.63	.61	.60	.61	.59	.59	.57	.57	.55	.53
2	.61	.58	.56	.54	.57	.54	.56	.53	.54	.51	.49
3	.58	.55	.52	.50	.54	.49	.52	.49	.51	.48	.46
4	.55	.51	.48	.46	.51	.46	.49	.45	.48	.45	.43
5	.53	.48	.45	.43	.48	.42	.47	.42	.46	.42	.40
6	.50	.45	.42	.40	.45	.39	.44	.39	.43	.39	.38
7	.48	.43	.39	.37	.42	.37	.41	.37	.41	.36	.35
8	.45	.40	.37	.35	.40	.35	.39	.34	.39	.34	.33
9	.43	.38	.35	.32	.38	.32	.37	.32	.37	.32	.31
10	.41	.36	.33	.31	.36	.31	.35	.30	.35	.30	.30
P913 On P913 On							/ania	x .95	5		

70%

70 50 30 10 50 10 50 10 50 10

.45 .41 .37 .35 .40 .35 .40 .35 .39 .35 .34

.41 .36 .33 .31 .36 .31 .36 .31 .35 .31 .30

.39 .34 .31 .29 .34 .29 .34 .29 .33 .29 .28

Zonal Cavity Method - Floor Reflectance 20%

.52

.33

50%

.58 .56 .56 .55 .54 .53 .50

.43 .38 .42 .37 .41 .37 .36

.38 .33 .37 .33 .37 .33 .32

.46 .49

.55 .51 .53 .50 .51

30% 0

0

.49 .47

.46 .44

Coefficients of Utilization

See notes 4 and 5.

15° P913 32W Triple Tube Osram Eff. 55% S/M .78

25

350

525

700

875

1050

1225

1400

1575

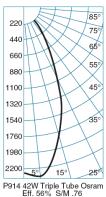
1750

5

15°

P914 42W Triple Tube Philips Eff. 46% S/M .92

1600



85 175

O 42W P 42W 0 3200* 3200* 75 2221 2284 2071 1771 1414 1134 891 1574 1721 65 1695 1552 55 1294 1047 785 45

Vertical Angles
 * Initial Lamp Lumens

P914 One 42W Triple Tube Osram Sylvania P914 One 42W Triple Tube Philips x .84 Vertical Angles Initial Lamp Lumens

.43 .38 .35

80%

.61 .60 .58 .57

.48 .43 .40 .38

58 56 .54

.55 .52 .49 .47 .51 .47 .50

Notes

Ceiling

Wall %

RCR

1

2

3

4 .53 .49 .46 .44 .48 .43 .47 .43 .46 .42 .41

5 .50 .46 .43 .41 .45 .40 .44 .40 .43 .40 .39

6 7

8

9

10

- 1 Data on all charts calculated with a clear specular cone finish. 2 Specular cone multipliers: Wheat x .84, Pewter x .74, Mocha x .74, Graphite x .71, Titanium x .71, Bronze x .67.
- 3 Softglow[®] cone multipliers: Wheat x .71, Pewter x .65,
- Mocha x .65, Graphite x .63, Titanium x .63, Bronze x .61.
- A Single unit Datachart pattern diameters are determined by the number of degrees from each side of nadir. Therefore a 20° diameter represents a total 40° pattern width at the work plane 30° above the floor. Footcandle values are at the edge of that diameter. Datachart spacing is rounded off to the nearest foot.
- 5 Compact fluorescent data vary due to lamp lumen differences power input, burning position, ambient temperature and ballast characteristics. A modification factor should be applied.
- 6 Brightness data from the Average Luminance Method are inaccurate for small aperture downlights. They are theoretical calculations derived for large surfaces such as troffers. For a complete discussion refer to section Z brochure Z1.

Number Lamps

Brightness

Lamps	85°	75°	65°	55°	45°
32W Osram Sylvania Triple Tube	8	29	49	145	8831
32W Philips Triple Tube	10	30	52	134	6900
42W Osram Sylvania Triple Tube	12	40	67	199	11298
42W Philips Triple Tube	14	40	71	178	9022
	32W Osram Sylvania Triple Tube 32W Philips Triple Tube 42W Osram Sylvania Triple Tube	32W Osram Sylvania Triple Tube 8 32W Philips Triple Tube 10 42W Osram Sylvania Triple Tube 12	32W Osram Sylvania Triple Tube82932W Philips Triple Tube103042W Osram Sylvania Triple Tube1240	32W Osram Sylvania Triple Tube8294932W Philips Triple Tube10305242W Osram Sylvania Triple Tube124067	32W Osram Sylvania Triple Tube 8 29 49 145 32W Philips Triple Tube 10 30 52 134 42W Osram Sylvania Triple Tube 12 40 67 199

Data in footlamberts. Photometer readings, Maximum Brightness Method. See note 6.

💽 Kurt Versen Company, Westwood, New Jersey

Lamp Type C2



Product Number: 20885

Order Abbreviation:	CF32DT/E/IN/835/ECO
General	DULUX 32W triple compact flu
Description:	with electronic and dimming b

DULUX 32W triple compact fluorescent amalgam lamp with 4-pin base, integral EOL, 3500K color temperature, 82 CRI, for use with electronic and dimming ballasts, ECOLOGIC

Product Information								
Abbrev. With Packaging Info.	CF32DTEIN835ECO 50/CS 1/SKU							
Average Rated Life (hr)	12000							
Base	GX24Q-3							
Bulb	Т (Т4)							
Color Rendering Index (CRI)	82							
Color Temperature/CCT (K)	3500							
Family Brand Name	Dulux® T/E							
Industry Standards	IEC 60901- 7432							
Initial Lumens at 25C	2328							
Mean Lumens at 25C	2002							
Maximum Overall Length - MOL (in)	5.6							
Maximum Overall Length - MOL (mm)	142							
NEMA Generic Designation (current)	CFTR32W/GX24Q/835							
NEMA Generic Designation (old)	CFM32W/GX24Q/835							
Nominal Wattage (W)	32.00							

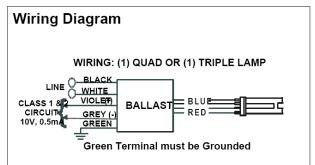
Ballast Type C2



Electrical Specifications

IZT-1T42-M2-BS@120								
Brand Name MARK 7 0-10V								
Ballast Type	Electronic Dimming							
Starting Method	Programmed Start							
Lamp Connection	Series							
Input Voltage	120-277							
Input Frequency	50/60HZ							
Status	Active							

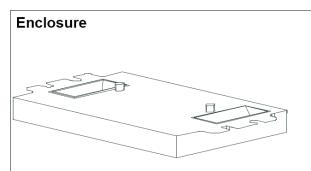
Lamp Type	Num. of Lamp s	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (Watts) (min/max)	Ballast Factor (min/max)	MAX THD %	Power Factor	Lamp Current Crest Factor	B.E.F.
CFM26W/GX24Q	1	26	50/10	0.25	08/29	0.05/1.00	14	0.95	1.4	3.45
* CFM32W/GX24Q	1	32	50/10	0.33	09/39	0.05/1.00	10	0.97	1.4	2.56
CFM42W/GX24Q	1	42	50/10	0.42	09/50	0.05/1.00	10	0.98	1.4	2.00
CFQ26W/G24Q	1	26	50/10	0.25	08/29	0.05/1.00	14	0.95	1.4	3.45



The wiring diagram that appears above is for the lamp type denoted by the asterisk $(\ensuremath{^*})$

Standard Lead Length (inches)

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



Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
4.98 "	3.00 "	1.29 "	2.00 "
4 49/50	3	1 29/100	2
12.6 cm	7.6 cm	3.3 cm	5.1 cm

Revised 06/18/2003

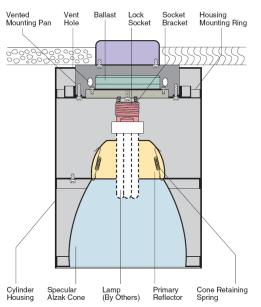


Data is based upon tests performed by Advance Transformer in a controlled environment and representative of relative performance. Actual performance can vary depending on operating conditions. Specifications are subject to change without notice. All specifications are nominal unless otherwise noted.

ADVANCE

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

Fixture Type C3





Dimensions and Lamps

	23			
	A Depth	B Aperture	C Diameter	Lamp
P913	14¹/₂"	7¹/₄"	9 ¹ /4"	26-32W
	368mm	184mm	235mm	Triple Tube CFL
P914	14½"	7¹/₄"	9 ^{1/} 4"	42W
	368mm	184mm	235mm	Triple Tube CFL

Surface Mount Cylinder 71/4" Conoid Apertures

Optics and Applications

The two element optical systems have computer designed primary reflectors and parabolic low brightness shielding cones. Distribution from a single vertically mounted triple tube lamp is for general and task lighting. Spacing to mounting height ratios range from .76 to .97 depending upon which lamp is mounted. Use in corridors, entries, over work stations, or for open area lighting.

Design Features

Twist and lock sockets prevent the lamps from falling if not properly engaged. They are a dependable fail-safe mechanism to prevent litigation.

Finish

Specular clear Alzak cones are standard. Optional colors and Softglow® finishes are available. Interiors are optical matte black, the exterior is matte white baked enamel.

Ballasts

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

General

Fixtures are UL and C-UL listed for thermal and electrical safety. Union made IBEW. Luminaire Efficiency Rating (LER) data is in the photometric directory located in Section Z.

BA

CC

WT White trim flange.

WHT White complete trim.

Custom color.

specify length.

Brushed aluminum.

Extra stem length,

Pendant adaptor, 21" length.

Accessories G

- Gold cone.
- Н Mocha cone.
- Ρ Graphite cone.
- Titanium cone. Т
- W Wheat cone.
 - P5 ES
- Υ Pewter cone.
- Ζ Bronze cone. Μ

S

- Wall or column mount. V347 347 volt ballast.
 - Softglow® finishes: add S before color letters. e.g. SW for Softglow[®] wheat cone, SC for Softglow[®] clear cone.
- DM Dimming ballast, contact the factory.
- EM Emergency power. Includes battery pack, charger light, test switch and single lamp operation for 90 minutes. Components are remote from fixture. Specify volts.

WRL Wattage restriction label, specify wattage.

Matching Units

Recessed cross baffled Recessed downlights Recessed wall washers

Page P24 Pages P53, P54, P55

Pages P64, P65, P66

** Click for link to pages in blue



P4

P41 P913 **P914**

Performance Datachart

Single Unit Initial Footcandles, 30" Work Plane				30" Wo	ork Pla	ane	Ceiling to Floor	Multiple Units Initial Footcandles, 30" Work Plane				
P913 One 3 P914 One 42								Ceiling 80% Walls 50% Floor 20%				
Nadir	1	0°	2	20°	3	0°		Spacing is	Maximum O	ver Work Pla	ine	
FC	FC	Diam	FC	Diam	FC	Diam		Spacing	RCR 1	RCR 3	RCR 8	
55	49	2'	<mark>30</mark>	4'	15	6'	8'	4'	78	<mark>68</mark>	50	
73	65	2'	39	4'	19	6'		4'	112	97	71	
29	26	3'	16	5'	8	9'	10'	6'	42	36	27	
39	35	3'	21	5'	10	9'		6'	60	52	38	
18	16	3'	10	7'	5	11'	12'	7'	26	23	17	
25	22	3'	13	7'	6	11'		7'	37	33	24	
13	11	4'	7	8'	3	13'	14'	9'	18	16	11	
17	15	4'	9	8'	4	13'		9'	26	22	16	
9	8	5'	5	10'	2	16'	16'	11'	13	11	8	
12	11	5'	6	10'	3	16'		10'	19	16	12	

Candlepower Distribution

85° 160 75° 320 65° 480 55 640 45° 800 960 35 1120 1280 1440 1600 15° 25 P913 32W Triple Tube Osram Eff. 55% S/M .78

220

440

660

880

1100

1320

1540

1760

1980

2200

85°

75°

65

55

45°

35

25

175

350

525

700

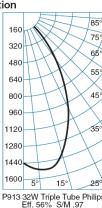
875

1050

1225

1400

1575 1750



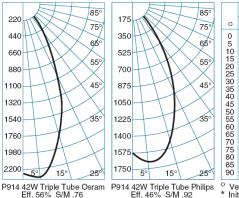
35°		O 32W	P 32W
75%	0	2400*	2400*
35° 55° 45° 35°	0 5 10 15 20 25 30 35 40 55 60 65 70 75 80 85 90	$\begin{array}{c} 1657\\ 1680\\ 1546\\ 1330\\ 1088\\ 905\\ 693\\ 479\\ 310\\ 53\\ 9\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\$	$\begin{array}{c} 1421\\ 1535\\ 1540\\ 1420\\ 1219\\ 1016\\ 771\\ 504\\ 212\\ 33\\ 8\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\$
ilins	° Ve	artical And	les

Candelas

* Initial Lamp Lumens

3200*

O 42W P 42V



5	0 *	Vertical Angles Initial Lamp Lumens
---	--------	--

P914 One	42W	Triple	Tube	Osran	n Sylv	ania	
Det 4 Olic	1014	Tipic	Tube	DUT	1 Oyliv	, and	
P914 One	4200	Iriple	LUDE	Philips	SX 84	1	

Notes

- 1 Data on all charts calculated with a clear specular cone finish. 2 Specular cone multipliers: Wheat x .84, Pewter x .74, Mocha x .74, Graphite x .71, Titanium x .71, Bronze x .67.
- 3 Softglow[®] cone multipliers: Wheat x .71, Pewter x .65, Mocha x .65, Graphite x .63, Titanium x .63, Bronze x .61.
- 4 Single unit Datachart pattern diameters are determined by the number of degrees from each side of nadir. Therefore a 20° diameter represents a total 40° pattern width at the work plane 30° above the floor. Footcandle values are at the edge of that diameter. Datachart spacing is rounded off to the nearest foot.
- 5 Compact fluorescent data vary due to lamp lumen differences, power input, burning position, ambient temperature and ballast characteristics. A modification factor should be applied.
- 6 Brightness data from the Average Luminance Method are inaccurate for small aperture downlights. They are theoretical calculations derived for large surfaces such as troffers. For a complete discussion refer to section Z brochure Z1.

Brightn	ess
Musee In an	1

15°

Number	Lamps	85°	75°	65°	55°	45°
P913	32W Osram Sylvania Triple Tube	8	29	49	145	8831
1910	32W Philips Triple Tube	10	30	52	134	6900
P914	42W Osram Sylvania Triple Tube	12	40	67	199	11298
1 3 1 4	42W Philips Triple Tube	14	40	71	178	9022

5

Data in footlamberts. Photometer readings, Maximum Brightness Method. See note 6.



🚯 Kurt Versen Company, Westwood, New Jersey

See notes 4 and 5.

Coeffi	Coefficients of Utilization										
Ceiling		80)%		70	70%)%	30	30%	
Wall %	70	50	30	10	50	10	50	10	50	10	0
RCR	Zor	nal Ca	avity	Meth	od - F	loor	Refle	ctan	ce 20	%	
1	.64	.63	.61	.60	.61	.59	.59	.57	.57	.55	.53
2	.61	.58	.56	.54	.57	.54	.56	.53	.54	.51	.49
3	.58	.55	.52	.50	.54	.49	.52	.49	.51	.48	.46
4	.55	.51	.48	.46	.51	.46	.49	.45	.48	.45	.43
5	.53	.48	.45	.43	.48	.42	.47	.42	.46	.42	.40
6	.50	.45	.42	.40	.45	.39	.44	.39	.43	.39	.38
7	.48	.43	.39	.37	.42	.37	.41	.37	.41	.36	.35
8	.45	.40	.37	.35	.40	.35	.39	.34	.39	.34	.33
9	.43	.38	.35	.32	.38	.32	.37	.32	.37	.32	.31
10	.41	.36	.33	.31	.36	.31	.35	.30	.35	.30	.30

P913 One 32W Triple Tube Philips P913 One 32W Triple Tube Osram Sylvania x .95

P 42W	Ceiling		80)%		70)%	50	1%	30)%	0
3200*	Wall %	70	50	30	10	50	10	50	10	50	10	0
1574 1721	RCR	Zon	alCa	avity l	Meth	od - F	loor	Refle	ctanc	e 20	%	
1695	1	.61	.60	.58	.57	.58	.56	.56	.55	.54	.53	.50
1552 1294	2	.58	.56	.54	.52	.55	.51	.53	.50	.51	.49	.47
1047 785	3	.55	.52	.49	.47	.51	.47	.50	.46	.49	.46	.44
544 276	4	.53	.49	.46	.44	.48	.43	.47	.43	.46	.42	.41
38	5	.50	.46	.43	.41	.45	.40	.44	.40	.43	.40	.39
9 0	6	.48	.43	.40	.38	.43	.38	.42	.37	.41	.37	.36
0 0	7	.45	.41	.37	.35	.40	.35	.40	.35	.39	.35	.34
0 0	8	.43	.38	.35	.33	.38	.33	.37	.33	.37	.33	.32
Ŏ O	9	.41	.36	.33	.31	.36	.31	.36	.31	.35	.31	.30
0	10	.39	.34	.31	.29	.34	.29	.34	.29	.33	.29	.28

Lamp Type C3



Order Abbreviation: CF42DT/E/IN/835/ECO General DULUX 42W triple com; with electronic and dim

Product Number: 20871

DULUX 42W triple compact fluorescent amalgam lamp with 4-pin base, integral EOL, 3500K color temperature, 82 CRI, for us with electronic and dimming ballasts, ECOLOGIC

	Product Information
Abbrev. With Packaging Info.	CF42DTEIN835ECO 50/CS 1/SKU
Average Rated Life (hr)	12000
Base	GX24Q-4
Bulb	Т (Т4)
Color Rendering Index (CRI)	82
Color Temperature/CCT (K)	3500
Family Brand Name	Dulux® EL
Initial Lumens at 25C	3104
Mean Lumens at 25C	2670
Maximum Overall Length - MOL (in)	6.5
Maximum Overall Length - MOL (mm)	163
NEMA Generic Designation (current)	CFTR/42W/GX24Q/835
Nominal Wattage (W)	42.00
	Additional Product Information
Product Documents, Graphs, and Images	
<u>Compatible Ballast</u>	

Packaging Information

Ballast Type C3

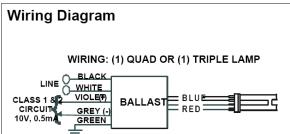


. - -ATAO NO DOGAOO

Electrical Specifications

IZI-1142-N	12-BS@120
Brand Name	MARK 7 0-10V
Ballast Type	Electronic Dimming
Starting Method	Programmed Start
Lamp Connection	Series
Input Voltage	120-277
Input Frequency	50/60HZ
Status	Active

Lamp Type	Num. of Lamp s	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.
CFM26W/GX24Q	1	26	50/10	0.25	08/29	0.05/1.00	14	0.95	1.4	3.45
CFM32W/GX24Q	1	32	50/10	0.33	09/39	0.05/1.00	10	0.97	1.4	2.56
* CFM42W/GX24Q	1	42	50/10	0.42	09/50	0.05/1.00	10	0.98	1.4	2.00
CFQ26W/G24Q	1	26	50/10	0.25	08/29	0.05/1.00	14	0.95	1.4	3.45

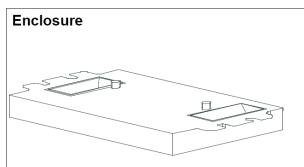


Green Terminal must be Grounded

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

Standard Lead Length (inches)

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



Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
4.98 "	3.00 "	1.29 "	2.00 "
4 49/50	3	1 29/100	2
12.6 cm	7.6 cm	3.3 cm	5.1 cm

Revised 06/18/2003



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

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

Fixture Type C4

DESCRIPTION

The Zuma 1201 series is a rugged ADA-compliant recessed mounted step light for use with a low voltage, T4 halogen lamp (provided). The housing and face plate are die-oast from corrosion-resistant silicone aluminum alloy. Model 1201-LA includes a louvered face plate; model 1201-OA features an open face plate. Both can be mounted in non-combustible surfaces such as brick, concrete or stone.

SPECIFICATION FEATURES

A ... Material

Face plate and recessed mounted housing are corrosion-resistant die-cast silicone eluminum. Housing includes two 1/2" NPS threaded holes for easy through wiring.

B ... Finish

Fixtures are double protected by a chromate conversion undercoating and polyester powderooat paint finish, surpassing the rigorous demands of the outdoor environment. A variety of standard colors are available.

C ... Reflector

Specular pebblestone aluminum reflector is standard to provide high lumen output and even illumination

D ... Gasket Housing and face plate are sealed with a high temperature silicone o ring gesket to prevent water intrusion.

E ... Lens

Diffused tempered glass lens, factory sealed with high temperature adhesive to prevent water intrusion and breakage due to thermal shock.

F ... Hardware Stainless steel hardware is standard to provide maximum corrosion-resistance.

G ... Socket Ceramic pooket with 260° C Teflon® coated lead wires and GY6.36 bi-pin base.

H ... Electrical

Catalog #

Project

Com nta repared by

Remote 12V transformer required (not included). Available from Lumière as an accessory - see the Accessories & Technical Data section of this catalog for details.

L., Lamp

Included as standard. Optional diode connection reduces voltage to the lamp and extends lamp life up to 12,000 hours (specify option -CL).

J ... Labels & Approvals UL and oUL listed, standard wet label. Manufactured to ISO 9001-2000 Quality Systems Standard. IBEW union made.



ZUMA 1201-LA 1201-OA

35W (max.) T4 Halogen Low Voltage

Step Light

ADA-COMPLIANT

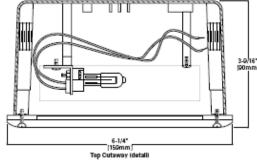




1201-0A Open Face Plate

1201-LA (Louvered Face Plate)







Specifications and Dimensions subject to change without notice.

ADL082510

LUMIÈRE[®]

Lamp Type C4



20T4Q/CL/AX 12V

Order 201 Abbreviation:

General Tungs Description: 12Volt

Tungsten Halogen Quartz Bi-Pin STARLITE Low Pressure Clear Finish UV-Stop With Axial Filament GY6.35 Bi-Pin Base 20Watt 12Volt 4000Hr Lamp Life

>

	Product Information
Abbrev. With Packaging Info.	20T4QCLAX 12V 40/CS 1/SKU
Approx. Lumens	320
Average Rated Life (hr)	4000
Base	GY6.35 Bipin
Bulb	T4
Class	C (gas)
Color Rendering Index (CRI)	100
Color Temperature/CCT (K)	3000
Diameter (in)	0.5
Diameter (mm)	12.7
Ecologic	YES
Family Brand Name	STARLITE® Bi-Pin
Filament	AXIAL
Lamp Finish	Clear
Light Center Length - LCL (in)	1.125
Light Center Length - LCL (mm)	28.575
Maximum Overall Length - MOL (in)	1.750
Maximum Overall Length - MOL (mm)	44.45
Nominal Voltage (V)	12.00
Nominal Wattage (W)	20.00

Fixture Type C5

iolighting.com







<u>C5</u>

luxrail



Hand Rail Size Options



Power Supply (Driver) Information

Standard Light Output

TYPE	SUPPLIES	REMOTE DISTANCE
24v20w	UP TO 78"	32'-0" (w/18awg)
24v100w	UP TO 35'-0"	18'-0" (w/18awg)
	(2) runs up to 49' with (1) run NTE 35'-0"	46'-0" (w/14 <i>a</i> wg) 71'-0" (w/12 <i>a</i> wg)

High Output

TYPE	SUPPLIES	REMOTE DISTANCE
24v100w	UP TO 12'-0"	18'-0" (w/18awg)
		46'-0" (w/14awg)
		71'-0" (w/12awg)

Application ANSI and ADA compliant luxrail, is an indoor/outdoor handrail that delivers functional illumination. Two intensities may be specified; "standard light output" & "high output". The standard lightoutput version delivers illuminance levels appropriate for exterior applications (3 to 4 footcandles at grade) as well as dark interior environments with low ambient illumination levels, (i.e. theater, thermed environments). The bidh auttrut version (i.e. theatres, themed environments). The high output version delivers illuminance levels applicable to interior environments providing in excess of 10 footcandles along the path of egress (ANSI required). Independent photometric test reports and IES Format data are available upon request from io Lighting.

luxrail's standard handrail gripping surfaces are circular in cross section and meet ADAAG (Americans with Disability Act Accessibility Guidelines). Beam spread options include 10, 45, and 65 degrees. The 45 and 65 degree beam patterns are most suitable for illuminating pathways while the 10 degree beam spread offers accent lighting to optional glass or stainless steel cable railing infills. Reference page 8 for information regarding infill options. LED lumen depreciation at 50,000 hrs. is 30%.

Light Output

luxrail is available with two luminous intensities:

Standard:

- · Warm White: 38 Ims/ft
- · Cool White: 48 Ims/ft

High Output:

- · Warm White: 127 Ims/ft
- · Cool White: 145 Ims/ft

Construction

luxrail is available in stainless steel, aluminum or brass. luxrail may be post mounted or wall mounted. Mounting hardware (post or wall) is required up to 5' or 6' O.C., depending on the handrail alloy. The lighting fixture component of the luxrail is a stand alone unit and is available in incremental nominal lengths that range from 6" to 60". Vandal resistant access chamber allows units to be removed for maintenance purposes.

The light fixture's housing is made of a light weight, yet durable aluminum, providing the recommended heat sink requirements for the LEDs. Housing, optical assembly and stainless steel end caps are bonded to prevent water infiltration.

Electrical

Lucrail houses a low voltage LED based light fixture which is integrated into the underside of the handrail. It comes complete with the linear light fixture installed in the handrail and required power supplies (aka "drivers"). Electrical "daisy chain" connections must be made on site. 120 or 277 volt drivers are available. The drivers must be remotely located. Refer to Driver Chart (shown on left) for additional information.

Power Consumption

· standard: 2 w/ft

· high output: 8 w/ft

Finish

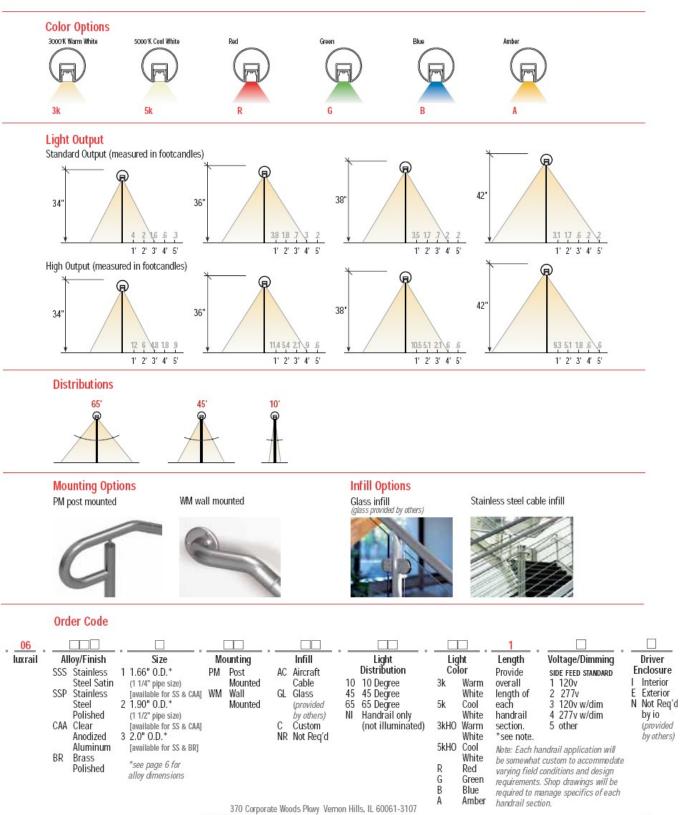
luxrail is available in a variety of finishes: polished or brushed stainless steel (satin finish with brush grain along the longitudinal axis), clear anodized aluminum and polished brass. Custom finishes may be available upon request.

370 Corporate Woods Pkwy Vernon Hills, IL 60061-3107

T 847.735.7000 F 847.735.7001 E info@iolighting.com W iolighting.com

luxrail





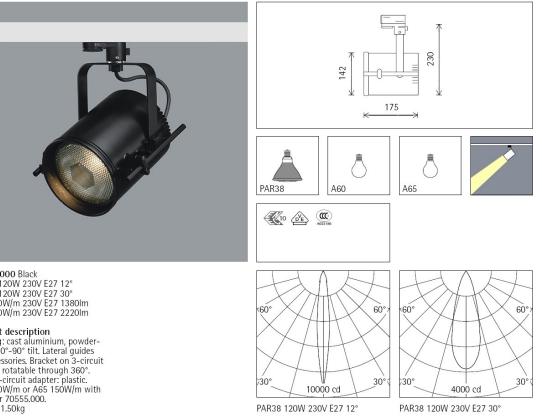
T 847.735.7000 F 847.735.7001 E info@iolighting.com W iolighting.com

0

io



Fixture Type C6 TM Spotlight for PAR lamps and general service lamps



77460.000 Black PAR38 120W 230V E27 12° PAR38 120W 230V E27 30° A60 100W/m 230V E27 1380Im A65 150W/m 230V E27 2220Im

Product description Housing: cast aluminium, powder-coated. 0°-90° tilt. Lateral guides for accessories. Bracket on 3-circuit adapter rotatable through 360°. ERCO 3-circuit adapter: plastic. A60 100W/m or A65 150W/m with reflector 70555.000. Weight 1.50kg

h(m)	E(Ix)	D(m)
		12°
1	9300	0.21
2	2325	0.42
3	1033	0.63
4	581	0.84
5	372	1.05

PAR38	120W	230V E27 3
h(m)	E(Ix)	D(m) 30°
1 2 3 4	3100 775 344 194	0.54 1.07 1.61 2.14
5	124	2.68



Mounting ERCO 3-circuit track Hi-trac 3-circuit track Monopoll 3-circuit track 1-circuit singlet

ERCO Leuchten GmbH Postfach 2460 58505 Lüdenscheid Germany Tel.: +49 2351 551 0 Fax: +49 2351 551 300 info@erco.com

Technical Region: 230V/50Hz Edition: 16.11.2006 Please download the current version from www.erco.com/77460.000

ERCO

TM Spotlight

Cleaning Ambient LMF RSMF	g (a) t conditions	1 P 0.98 0.99	C 0.94 0.98	N 0.90 0.96	D 0.86 0.95	2 P 0.95 0.97	C 0.91 0.96	N 0.86 0.95	D 0.81 0.94	3 P 0.94 0.97	C 0.90 0.96	N 0.84 0.95	D 0.79 0.94
Hours of LLMF LSF	f operation (h)	1000 0.93 1											
MF LMF RSMF LLMF LSF P C N	LMFxRSMFxLLM Maintainance F Lumiaire Maint Room Surface I Lamp Lumens N Lamp Survival F Room pure Room clean Room normal Room dirty	actor enance Mainten Mainten	ance F										

Lamp Type C6



Product Number: 14848

Order Abbreviation: 120PAR38/HAL/NFL25 120V

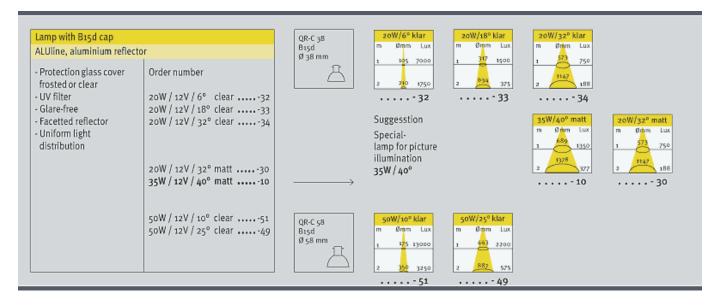
General Description: Tungsten Halogen CAPSYLITE PAR38 Reflector Lamp Medium Skirt Base 120Watt 120Volt Narrow Flood Beam

.

	Product Information
Abbrev. With Packaging Info.	120PAR38HALNFL25 120V 15/CS 1/SKU
Approx. Lumens	1800
Average Rated Life (hr)	3000
Base	E26 Medium Skirted
Beam Angle (deg)	25
Beam Type	NFL
Bulb	PAR38
Centerbeam Candlepower (cp)	7700
Class	C (gas)
Color Rendering Index (CRI)	100
Color Temperature/CCT (K)	2950
Diameter (in)	4.75
Diameter (mm)	120.65
Ecologic	YES
Family Brand Name	CAPSYLITE® PAR38 SPL
Filament	CC-8
Horizontal Beam Angle (deg)	25
Maximum Overall Length - MOL (in)	5.3125
Maximum Overall Length - MOL (mm)	134.9375
Nominal Voltage (V)	120.00



Fixture Type C7



Lamp Type C7

20833 - Q50MR16/C/FL40 GE ConstantColor® Precise™ MR16

GENERAL	CHARACTERISTICS
ULNEINAL	CHANACTERISTICS

	-
Lamp type	Halogen - MR
Bulb	MR16
Base	2-Pin (GX5.3)
Filament	C-6
Wattage	50
Voltage	12
Voltage (MIN)	50
Rated Life	6000 hrs
Rated Life (Vert)	6000 hrs
Lamp Enclosure Type (LET)	Open or enclosed fixtures



🔍 View Larger

PHOTOMETRIC CHARACTERISTICS

1700
1700
1700
1700
3050 K
34

DIMENSIONS

Maximum Overall Length (MOL)	1.8750 in (47.6 mm)
Bulb Diameter (DIA)	2.000 in (50.8 mm)

PRODUCT INFORMATION

Product Code	20833
Description	Q50MR16/C/FL40
ANSI Code	EXN
Standard Package	BUNDLE
Standard Package GTIN	00043168208338
Standard Package Quantity	20
Sales Unit	Unit
No Of Items Per Sales Unit	1
No Of Items Per Standard Package	20
UPC	043168994262

Testimonials Testimonials Brochures Application/Segment Brochures • Beauty Salon Lighting • Contractor Lighting • Healthcare Lighting • Office Lighting • Specialty Store Lighting • Product Brochures • Color

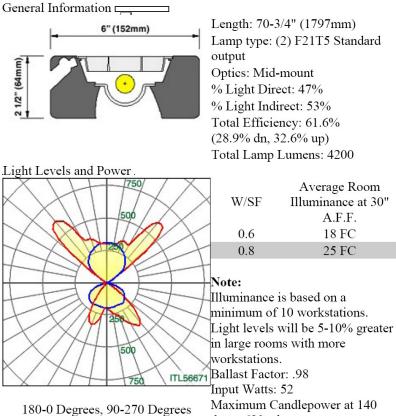
ADDITIONAL RESOURCES

Catalogs

- <u>Color</u>
 <u>XL Brochure</u>
- Sell Sheets
- GE ConstantColor® Precise™ MR16 Lamps IES/Photometric Download

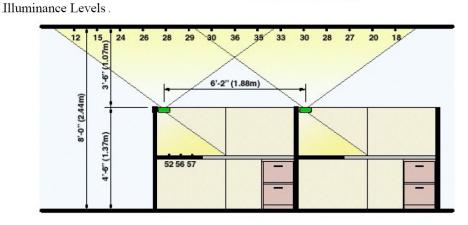
MSDS (Material Safety Data Sheets) Disposal Policies & Recycling Information

Fixture Type F1



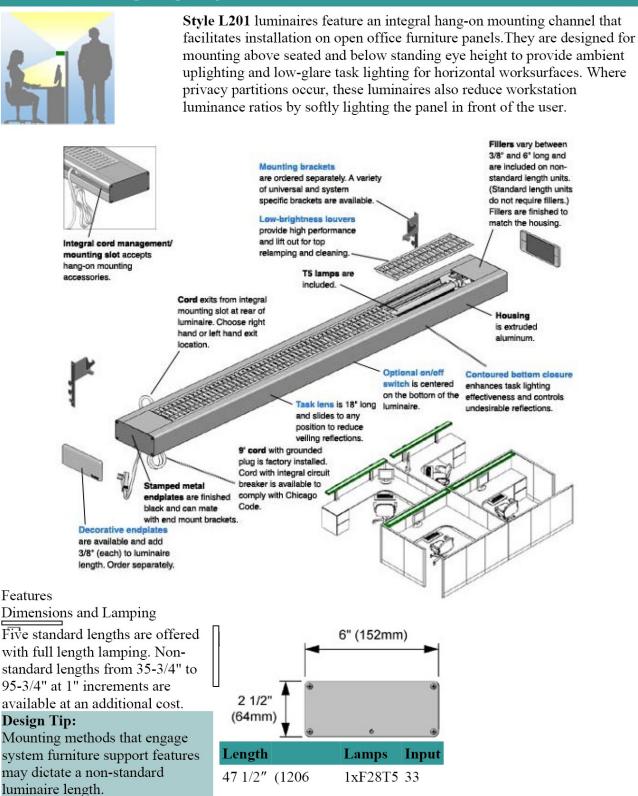
deg = 629 cd

Download IES file



Task Ambient Lighting - Style L201

Click to prin



Each luminaire is provided with one T5 fluorescent lamp or two	59″
tandem mounted T5 lamps	
according to the overall luminaire	70-3/4″
length. To limit the luminance of	
workstation surfaces, only	
standard output lamps are offered.	82 1/2"
The use of high-output T5 lamps is	
not recommended.	

mm) watts 41 (1499mm) 1xF35T5 watts 49 ' (1797mm) 2xF21T5 watts 1xF21T5 60 (2096 mm) +watts 1xF28T5 66 94 1/4" (2394mm) 2xF28T5 watts

3000K lamps are included. 3500K and 4100K lamps are available upon request.

Non-standard lamp configurations are available on large quantity orders (e.g. 71" luminaire with 1xF35T5 lamp). Consult factory.

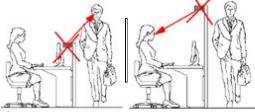
Mounting Height

Three optical configurations are available to accommodate 24" and 30" deep worksurfaces and mounting heights between 48" and 66".

Design Tip:

Mounting positions above 66" generally warrant the use of separate task and ambient lighting systems.

24" De Worksur	-	30″ Deep Worksurfaces		
Mounting Height	Optics	Mounting Height	Optics	
<u>≥</u> 48″ <u>≤</u> 50″	Low- mount	<u>≥</u> 48″ <u>≤</u> 52″	Low- mount	
>50" <u><</u> 57"	Mid- mount	>52" <u><</u> 61"	Mid- mount	
>57‴ <u><</u> 62″	High - mount	>61" ≤ 66"	High- mount	



Caution: To avoid discomfort glare, do not install these units below 48" A.F.F. or above 66" A.F.F. (62" for 24" deep worksurfaces). Note: These guidelines are based on a worksurface height of 28-1/2'' and a minimum seated eye height of 40-1/2''.





Caution: Panels that extend beyond the top of luminaire will restrict the uplight distribution and introduce undesirable panel brightness. Panel must not extend more than 1" above the top of the luminaire.

Mounting Accessories

Hang-on panel clamps are available for mounting workstation luminaires on partitions from 1-1/2" to 3-1/2" thick. Order panel clamps separately.

Desk clamp stanchions are available for mounting to worksurfaces from 1" to 2" thick. Order desk clamp stanchions separately.

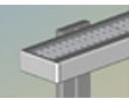
Style L201 luminaires are also compatible with **bridge mount stanchions** and **wall and panel mounting brackets**. See Accessories. **Design Tip:** For dedicated bridge and end mounted installations, consider Style L202 workstation luminaires with two smooth sides. (No rear mounting slot.)



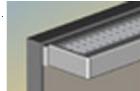
Panel clamp



Wall mount



Desk clamp stanchion



Panel mount

Tambient can supply mounting brackets for use with specific commercial office furniture systems and custom brackets for unique mounting conditions. Contact Tambient for details.

Ballasts

Danasts	
Luminaires are supplied with integral 120 volt, high	Total Harmonic Distortion (THD) < 10%
power factor electronic ballasts for energy efficiency.	Power Factor (PF) > 97%Ballast Factor* (BF) > 98%
Programmed start ballasts	Current Crest Factor (CF) < 1.7
are standard to maximize lamp life and minimize energy use.	Sound Rating A or better
	ANSI, IEEE, and FCC compliant
Manufacturer/model of furnished ballast(s) may vary. However, all ballasts	■UL listed (United States and Canada)
furnished meet or exceed the following criteria:	*Primary lamp application
Cords	

Cords are factory installed, 18 gauge, 3-conductor, Type SJT with grounded plug in accordance with UL153 (*Standard for Portable Electric Luminaires*) and the associated *Supplementary Requirements for Units for Use with Office Furnishings*.

Furnished cord length is 9 feet; the maximum length allowed by code. Standard cords are black. Gray and beige cords are available at an additional cost.

For installations in the City of Chicago, we offer cords with a circuit breaker in the plug to comply with the Chicago Electric Code. Chicago cords are offered in straight plug A choice of straight and sw rotation plugs is offered.



The **sw rotation plug** allows two low-profile plugs to engage adjacent outlets in one duplex receptacle while managing cords close to walls and office partitions.

Straight plugs are often best for use with power outlets in recessed floor boxes and access flooring systems.



All cord plugs are NEMA 5-15 configuration and require a compatible grounded electrical receptacle (by others).

Cord Exit Locations

Cord exits are concealed in a unique multi-purpose mounting slot at the rear of the luminaire. The slot contains cord management features allowing the cord to be routed horizontally (right or left) to any drop location, even when mounting accessories are inserted into the slot.



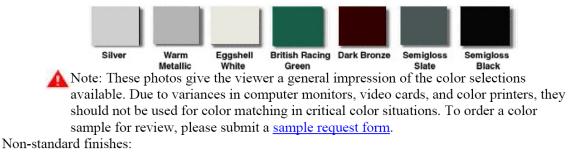
Left hand cord exit

Right hand cord exit

Finishes

6-stage pretreatment and electrostatically applied thermoset powder coat provides a stable, long-lasting and corrosion resistant finish.

Standard finishes:



RAL color finishes are available for a set up charge of \$300 per run. RAL finishes are Tiger Drylac®

Series 49 formulations and have a smooth glossy finish. <u>Contact your nearest Tiger Drylac® office</u> to obtain color samples. For non-RAL colors and other gloss factors specify a custom color finish. <u>Preview</u> <u>RAL colors</u>

Custom color finishes are available for a set up charge of \$750 per run. You must submit a color sample for Tambient to consider your custom color request.

Decorative Endplates

Decorative endplates are available and must be ordered separately. They install easily over the standard black endplates with a single concealed screw to form a decorative reveal. Decorative endplates add 3/8" (each) to the luminaire length.



Note: Luminaires with decorative endplates cannot be end-mounted. Decorative endplates can be removed to allow for end mounting if luminaire length corresponds to mounting location.

Safety Standards

All Tambient luminaires are UL listed to comply with United States and Canadian standards.



Lamp Type F1



Ballast Type F1



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

Electrical Specifications

Lamp Type	Num. of Lamp s	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	0.16	19	1.07	20	0.98	1.7	5.63
F14T5	2	14	0/-18	0.29	34	1.06	10	0.98	1.7	3.12
F21T5	1	21	0/-18	0.21	26	1.03	15	0.99	1.7	3.96
F21T5	2	21	0/-18	0.40	48	1.02	10	0.98	1.7	2.13
F28T5	1	28	0/-18	0.28	33	1.04	10	0.98	1.7	3.15
F28T5	2	28	0/-18	0.55	64	1.03	10	0.99	1.7	1.61
F35T5	1	35	0/-18	0.34	41	1.01	10	0.98	1.7	2.46
* F35T5	2	35	0/-18	0.67	80	1.00	10	0.99	1.7	1.25

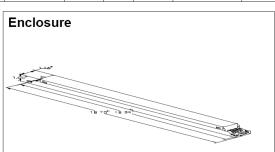
Wiring Diagram



The wiring diagram that appears above is for the lamp type denoted by the asterisk $(\ensuremath{^*})$

Standard Lead Length (inches)

Black White	in. 0 0	cm. 0		Valley/Dhue	in.	cm.
	-	0		Vallaw/Dhua	0	-
White	0			Yellow/Blue	0	0
		0		Blue/White	0	0
Blue	0	0		Brown	0	0
Red	0	0		Orange	0	0
ellow	0	0		Orange/Black	0	0
Gray	0	0		Black/White	0	0
Violet	0	0		Red/White	0	0
	Red ellow Gray	Red0ellow0Gray0	Red 0 0 ellow 0 0 Gray 0 0	Red 0 0 ellow 0 0 Gray 0 0	Red 0 0 ellow 0 0 Gray 0 0 Black/White	Red 0 0 Orange 0 ellow 0 0 Orange/Black 0 Orange/Black 0 Gray 0 0 Black/White 0



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 08/21/2006

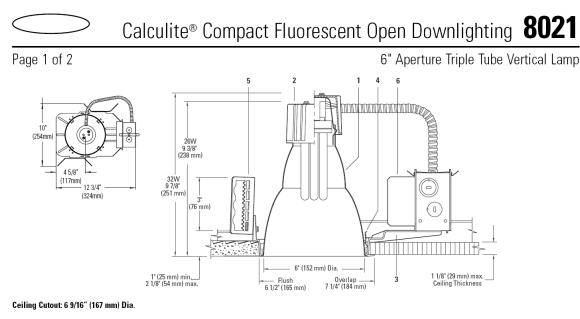


Data is based upon tests performed by Advance Transformer in a controlled environment and representative of relative performance. Actual performance can vary depending on operating conditions. Specifications are subject to change without notice. All specifications are nominal unless otherwise noted.

ADVANCE

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

Fixture Type F2



Reflector 1	Frim	Frame-In K	Frame-In Kit			
8021 CCLW 8021 CCLP 8021 CCL 8021	Comfort Clear™, White Flange Comfort Clear™, Polished Flange Comfort Clear™, Molded Trim Ring		Electronic Universal Dimming Advance Mark7	120V - 277V 120V - 277V 120V - 277V	26 or 32W Triple Tube 4-Pin (Amalgam)	
	Add suffix. See options for other finishes.	Remodeler	Frame-In Kit	Lamp		
		6132BURM	Electronic	120V - 277V	26 or 32W Triple Tube 4-Pin (Amalgam)	

Features

- 1. Reflector: 16 ga. Alzak® aluminum, 50° visual cutoff to lamp and lamp image, medium distribution. Comfort Clear™ low iridescence finish. Self-flanged or flangeless with molded white trim ring (field paintable).
- 2. Socket Cup: Effectively dissipates heat and positions lamp holder. Snaps onto reflector neck to assure consistently correct optical alignment without tools.
- 3. Mounting Frame: Galvanized steel for dry or plaster ceilings. Accepts other 6" Triple Tube reflectors (see S6132BU Spec Sheet).
- 4. Retaining Springs: Precision-tooled steel friction springs secure reflector to mounting frame for quick, tool-less installation.
- 5. Mounting Brackets: 16 ga. steel. Adjust from inside of fixture. Use 3/4" or 1 1/2" lathing channel, 1/2" EMT, or optional mounting bars.
- 6. Ballast/J-Box: Electronic 120V-277V. UL listed for through branch circuit wiring with max of (8) No. 12 AWG, 90°c supply conductors. Outboard mounted to reduce heat transfer and maintain lamp efficacy and life. Service from below without tools.

Electrical

Note: For ballast electrical data and latest lamp/ballast compatibility refer to "Ballast" specification sheet for complete electrical data. S6132BU, S6132BCU: UL listed for through branch circuit wiring with max

of (8) No. 12 AWG, 90° C supply conductors. 6132BURM: UL listed for No. 12 AWG, 90° C supply conductors.

Options and Accessories

Comfort Clear™ Finisl	ies ¹		Other F	inishes
Diffuse	CCD		White	WH
Champagne Bronze	CCZ			
Pewter	CPW			
1Specify desired flange	W/White	D Polishod	Blank - M	oldod Pina

Specify desired flange. W White, P Polished, Blank - Molded Ring

Other Dimming:

S6132BJ1MX Advance MarkX, 120V S6132BJ1LD3 Lutron Hi-lume®, 120V S6132BJ2MX Advance MarkX, 227V S6132BJ2LD3 Lutron Hi-lume®, 227V **Options and Accessories (continued)**

Emergency Ltg. Kit	FA EM3E*				
	FA EM4*				
Fuse (Slow Blow)	Add suffix F				
Existing/Thk. Ceiling	FA EC6*				
Emergency	Add suffix EM*				
Chicago Plenum	Use 6132BULC				
*See Spec. Sheets: FAE	M, FAEC				
Mounting Bars & Acces	sories; see Specification Sheet MBA.				
Sloped Ceiling Adapters; see Specification Sheet SCA.					
IC Frame available; see	C6CFL32 Specification Sheet.				

Labels

UL Listed for damp locations.

Alzak® is a registered trademark of ALCOA US Patent Pending.

Job Information Job Name: Cat. No.: Lamp(s): Notes:

Lightolier a Genlyte company

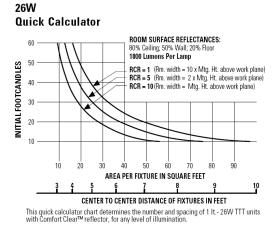
www.lightolier.com 631 Airport Road, Fall River, MA 02720 • (508) 679-8131 • Fax (508) 674-4710 We reserve the right to change details of design, materials and finish. © 2006 Genlyte Group LLC • E0406

Type:



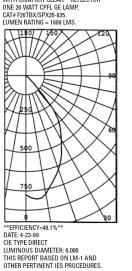
Calculite® Compact Fluorescent Open Downlighting 8021

Page 2 of 2



Spacing Ratio = 1.0

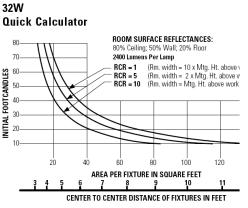
REPORT NO: LSI 14025 LIGHTOLIER RECESSED FLUORESCENT LUMINAIRE, WITH COMFORT CLEAR™ REFLECTOR



	_ SUMI		
	E CP LU	MENS	
0	775		
5	806	77	
10	780		
15	708	199	
20	646		
25	566	258	
30	478		
35	402	245	
40	285		
45	78	81	
50	13		
55	4	4	
60	2		
65	1	2	
70	1		
75	1	1	
80	0		
85	0	0	
			RCENTAGES
			LUMINAIRE
0-30	533	29.66	61.66
0-40	778	43.25	89.92
0-60	863	47.98	99.75
0-90	865	48.10	100.00
40-90	87	4.85	10.08
60-90	2	.12	.25
90-180	0	.00	.00
0-180	865	48.10	100.00

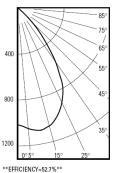
Coefficients of Utilization

EFFECTIVE FLOOR CAVITY REFLECTANCE = .20									
	80	70	50	30	10				
		WAL	L OF REFLEC	TANCE					
	50 30 10	50 30 10	50 30 10	50 30 10	50 30 10	0			
1	.54 .53 .52	.53 .52 .51	.51 .50 .49	.49 .48 .48	.47 .47 .46	.46			
2	.50 .49 .47	.50 .48 .47	.48 .47 .46	.47 .46 .45	.45 .45 .44	.43			
3 4 5 6 7 8 9	.47 .45 .44	.47 .45 .43	.46 .44 .43	.44 .43 .42	.43 .42 .41	.41			
₩ 4	.45 .42 .40	.44 .42 .40	.43 .41 .40	.42 .41 .39	.41 .40 .39	.38			
≧ 5	.42 .39 .37	.42 .39 .37	.41 .39 .37	.40 .38 .37	.39 .38 .36	.36			
₹ 6	.40 .37 .35	.39 .37 .35	.39 .36 .35	.38 .36 .34	.37 .36 .34	.34			
27	.37 .34 .33	.37 .34 .32	.36 .34 .32	.36 .34 .32	.35 .33 .32	.31			
Q 8	.35 .32 .30	.34 .32 .30	.34 .32 .30	.34 .31 .30	.33 .31 .30	.29			
8 9	.33 .30 .28	.32 .30 .28	.32 .30 .28	.32 .29 .28	.31 .29 .28	.27			
10	.31 .28 .26	.30 .28 .26	.30 .28 .26	.30 .27 .26	.29 .27 .26	.25			



This quick calculator chart determines the number and spacing of 1 lt.- 32W TTT un with Comfort Clear™ reflector, for any level of illumination

Spacing Ratio = 1.1



DATE: 4-27-99 CIE TYPE DIRECT LUMINOUS DIAMETER: 6.000 THIS REPORT BASED ON LM-1 AND OTHER PERTINENT IES PROCEDURES.

0 1035 ZONAL LUMENS & ND PECENTAGES ZONE LUMENS % LAMP % LUMINAIRE 0-30 821 34.2 64.9 0-40 1175 49.0 92.9 0-60 1260 52.5 99.6 0-90 1265 52.7 100.0 0-90 9 0 3.8 7.1 60-90 5 0.2 0.4 90-120 0 0.0 0.0 90-180 0 0.0 0.0 90-180 1265 52.7 100.0 0.0 52.7 0-180 1265

100.0

Coefficients of Utilization

	EFFE	CTIVE FLOOI	R CAVITY RE	FLECTANCE =	.20	
	80	70	50	30	10	
	50 30 10		L OF REFLEC 50 30 10	TANCE 50 30 10	50 30 10	0
1	.59 .58 .57	.58 .57 .56	.56 .55 .54	.54 .53 .53	.52 .52 .51	.50
2	.56 .54 .53	.55 .54 .52	.54 .52 .51	.52 .51 .50	.51 .50 .49	.48
<u> </u>	.53 .51 .50	.53 .51 .49	.51 .50 .49	.50 .49 .48	.49 .48 .47	.46
ROOM CAVITY RATIO	.51 .48 .47	.50 .48 .46	.49 .47 .46	.48 .46 .45	.47 .46 .45	.44
≥ 5	.48 .46 .44	.48 .45 .44	.47 .45 .43	.46 .44 .43	.45 .44 .43	.42
₩ 6	.46 .43 .42	.46 .43 .41	.45 .43 .41	.44 .42 .41	.44 .42 .41	.40
27	.44 .41 .39	.43 .41 .39	.43 .41 .39	.42 .40 .39	.42 .40 .39	.38
5 8	.41 .39 .37	.41 .39 .37	.41 .38 .37	.40 .38 .37	.40 .38 .36	.36
8 9	.39 .36 .35	.39 .36 .35	.38 .36 .35	.38 .36 .34	.38 .36 .34	.34
10	.35 .32 .31	.35 .32 .31	.35 .32 .30	.34 .32 .30	.34 .32 .30	.30
	ob Info	rmati	on	Type		

Lightolier a Genlyte company

www.lightolier.com 631 Airport Road, Fall River, MA 02720 • (508) 679-8131 • Fax (508) 674-4710 We reserve the right to change details of design, materials and finish. © 2006 Genlyte Group LLC • C0406

6" Aperture Triple Tube Vertical Lamp

Lamp Type F2



Product Number: 20881

Order CF26DT/E/IN/835/ECO Abbreviation:

General Description:

DULUX 26W triple compact fluorescent amalgam lamp with 4-pin base, integral EOL, 3500K color temperature, 82 CRI, for use with electronic and dimming ballasts, ECOLOGIC

Product Information					
CF26DTEIN835ECO 50/CS 1/SKU					
12000					
GX24Q-3					
T (T4)					
82					
3500					
Dulux® T/E					
IEC 60901- 3426					
1746					
1501					
5.0					
126					
CFTR26W/GX24Q/835					
CFM26W/GX24Q/835					
26.00					

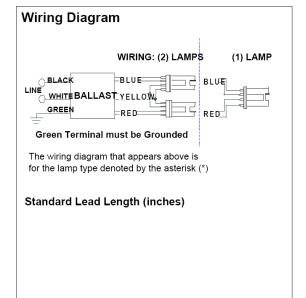
Ballast Type F2

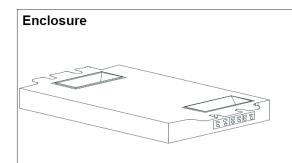


Electrical Specifications

ICF2S42900	CM2LD@120
Brand Name	SMARTMATE
Ballast Type	Electronic
Starting Method	Programmed Start
Lamp Connection	Parallel
Input Voltage	120
Input Frequency	50/60 HZ
Status	Active

	Lamp Type	Num. of Lamp s	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.
×	CFM26W/GX24Q	1	26	0/-18	0.25	29	1.10	10	0.98	1.5	3.79
	CFM26W/GX24Q	2	26	0/-18	0.46	55	1.00	10	0.98	1.5	1.82





Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
4.98 "	3.00 "	1.29 "	4.60 "
4 49/50	3	1 29/100	4 3/5
12.6 cm	7.6 cm	3.3 cm	11.7 cm



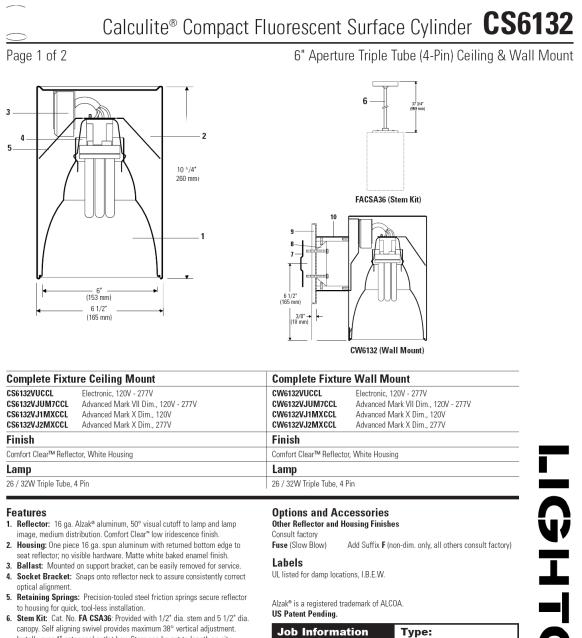
Revised 08/21/2006

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 notec

ADVANCE

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

Fixture Type F3



- Installs over 4" octagonal outlet box. Stem can be cut to length on site. Matte white baked enamel finish. 7. Crossbar: Installs over 3" or 4" octagonal or rectangular outlet box.
- 8. Cleat: Cast aluminum; allows mounting to mullion or post without
- backplate
- 9. Backplate: Die-cast aluminum; 6 1/4" high by 4" wide; matte white. 10. Bracket: Extruded aluminum: matte white finish. Secured to cleat by set screws

Electrical

Note: For ballast electrical data and latest lamp/ballast compatibility refer to "Ballast" specification sheet for complete electrical data.

UL listed for 90°C supply conductors.

Job Information Job Name:

Cat. No.:

Lamp(s):

Notes:

Lightolier a Genlyte Thomas Company

www.lightolier.com 631 Airport Road, Fall River, MA 02720 • (508) 679-8131 • Fax (508) 674-4710 We reserve the right to change details of design, materials and finish. © 2004 Genlyte Thomas Group LLC (Lightolier Division) • C0704

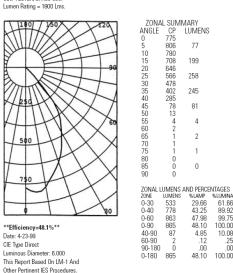


Calculite® Compact Fluorescent Surface Cylinder CS6132

Page 2 of 2

26W

Spacing Ratio = 1.0 Report No: LSI 14025 Lightolier Recessed Fluoresco One 26 Watt CPFL GE Lamp, rescent Luminaire, With Comfort Clear™ Reflector Cat# F26TBX/SPX35-835.



6" Aperture Triple Tube (4-Pin) Ceiling & Wall Mount

ZONAL SUMMARY

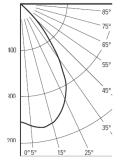
0 0

0000

AUSUMMARY AVG* ZONAL C.P. LUMENS 0 0 0 0

32W

Spacing Ratio = 1.1 Report Prepared For: Lightolier 04-27-1999 Report No: LRL 499-9G Lamps: 1 PLT-32 Lumens: 2400 Descrip.: 6" Dia X 10" Ht Recessed Downlight With Comfort Clear™ Reflector. Vertical Lamp.



Efficiency=52.7% Date: 4-27-99 CIE Type Direct Luminous Diameter: 6.000 This Report Based On LM-1 And Other Pertinent IES Procedures.

611MINAIR 61.66 89.92 99.75 100.00 10.08

.25 .00 100.00

105 95 90 85 75 65 55 45 35 25	0 0 1 3 99 563 904	0 0 1 3 8 77 354 418	
15 5	1063 1066	301 102	
0 70NAL	1035	ND PERCE	NTACES
ZONE	LUMENS	% LAMP	%LUMINAIRE
0-30	821	34.2	64.9
0-40 0-60	1175 1260	49.0 52.5	92.9 99.6
0-90	1265	52.7	100.0
40-90	90	3.8	7.1
60-90 90-120	5	0.2	0.4 0.0
90-120		0.0 0.0	0.0
90-180	ŏ	0.0	0.0
0–180	1265	52.7	100.0

Coefficients of Utilization

Effective Floor Cavity Reflectance = .20									
		80	70	50	30	10			
			V	Vall Reflecta	nce				
		50 30 10	50 30 10	50 30 10	50 30 10	50 30 10	0		
	1	.59 .58 .57	.58 .57 .56	.56 .55 .54	.54 .53 .53	.52 .52 .51	.50		
	2	.56 .54 .53	.55 .54 .52	.54 .52 .51	.52 .51 .50	.51 .50 .49	.48		
Ę.	3	.53 .51 .50	.53 .51 .49	.51 .50 .49	.50 .49 .48	.49 .48 .47	.46		
Ba.	4	.51 .48 .47	.50 .48 .46	.49 .47 .46	.48 .46 .45	.47 .46 .45	.44		
Ϊţ	5	.48 .46 .44	.48 .45 .44	.47 .45 .43	.46 .44 .43	.45 .44 .43	.42		
Cav	6	.46 .43 .42	.46 .43 .41	.45 .43 .41	.44 .42 .41	.44 .42 .41	.40		
Room Cavity Ratio	7	.44 .41 .39	.43 .41 .39	.43 .41 .39	.42 .40 .39	.42 .40 .39	.38		
Boc	8	.41 .39 .37	.41 .39 .37	.41 .38 .37	.40 .38 .37	.40 .38 .36	.36		
_	9	.39 .36 .35	.39 .36 .35	.38 .36 .35	.38 .36 .34	.38 .36 .34	.34		
	10	.35 .32 .31	.35 .32 .31	.35 .32 .30	.34 .32 .30	.34 .32 .30	.30		

IGHTOLIE

Job Information

Type:

Lightolier a Genlyte Thomas Company www.lightolier.com G31 Airport Road, Fall River, MA 02720 • (508) 679-8131 • Fax (508) 674-4710
 We reserve the right to change details of design, materials and finish.
 © 2004 Genlyte Thomas Group LLC (Lightolier Division) • C0704

Coefficients of Utilization

Effective Floor Cavity Reflectance = .20

			80			70			50			30			10		
							V	Vall	Refl	ecta	nce						
		50	30	10	50	30	10	50	30	10	50	30	10	50	30	10	0
	1	.54	.53	.52	53	.52	.51	.51	.50	.49	.49	.48	.48	47	.47	.46	.46
	2	.50	.49	.47	50	.48	.47	.48	.47	.46	.47	.46	.45	45	.45	.44	.43
Ę.	3	.47	.45	.44	47	.45	.43	.46	.44	.43	.44	.43	.42	43	.42	.41	.41
Ba	4	.45	.42	.40	44	.42	.40	.43	.41	.40	.42	.41	.39	41	.40	.39	.38
Ξć	5	.42	.39	.37	42	.39	.37	.41	.39	.37	.40	.38	.37	39	.38	.36	.36
G	6	.40	.37	.35	39	.37	.35	.39	.36	.35	.38	.36	.34	37	.36	.34	.34
Room Cavity Ratio	7	.37	.34	.33	37	.34	.32	.36	.34	.32	.36	.34	.32	35	.33	.32	.31
ß	8	.35	.32	.30	34	.32	.30	.34	.32	.30	.34	.31	.30	33	.31	.30	.29
	9	.33	.30	.28	32	.30	.28	.32	.30	.28	.32	.29	.28	31	.29	.28	.27
	10	.31	.28	.26	30	.28	.26	.30	.28	.26	.30	.27	.26	29	.27	.26	.25

186

Lamp Type F3



Product Number: 20881

Order CF26DT/E/IN/835/ECO Abbreviation:

General Description:

DULUX 26W triple compact fluorescent amalgam lamp with 4-pin base, integral EOL, 3500K color temperature, 82 CRI, for use with electronic and dimming ballasts, ECOLOGIC

Product Information						
Abbrev. With Packaging Info.	CF26DTEIN835ECO 50/CS 1/SKU					
Average Rated Life (hr)	12000					
Base	GX24Q-3					
Bulb	T (T4)					
Color Rendering Index (CRI)	82					
Color Temperature/CCT (K)	3500					
Family Brand Name	Dulux® T/E					
Industry Standards	IEC 60901- 3426					
Initial Lumens at 25C	1746					
Mean Lumens at 25C	1501					
Maximum Overall Length - MOL (in)	5.0					
Maximum Overall Length - MOL (mm)	126					
NEMA Generic Designation (current)	CFTR26W/GX24Q/835					
NEMA Generic Designation (old)	CFM26W/GX24Q/835					
Nominal Wattage (W)	26.00					

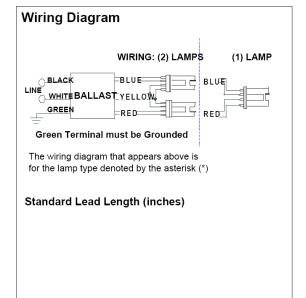
Ballast Type F3

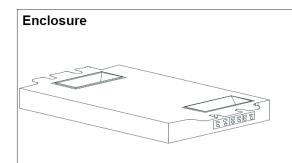


Electrical Specifications

ICF2S4290CM2LD@120								
Brand Name	SMARTMATE							
Ballast Type	Electronic							
Starting Method	Programmed Start							
Lamp Connection	Parallel							
Input Voltage	120							
Input Frequency	50/60 HZ							
Status	Active							

	Lamp Type	Num. of Lamp s	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.
×	CFM26W/GX24Q	1	26	0/-18	0.25	29	1.10	10	0.98	1.5	3.79
	CFM26W/GX24Q	2	26	0/-18	0.46	55	1.00	10	0.98	1.5	1.82





Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
4.98 "	3.00 "	1.29 "	4.60 "
4 49/50	3	1 29/100	4 3/5
12.6 cm	7.6 cm	3.3 cm	11.7 cm



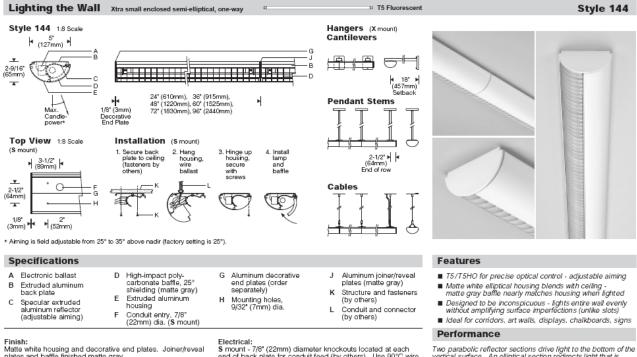
Revised 08/21/2006

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 notec

ADVANCE

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

Fixture Type F4



Finish: Matte white housing and decorative end plates. Joiner/reveal plates and baffle finished matte gray. Painted surfaces - 6 stage pretreatment and electrostatically applied thermoset powder coat for stable, long lasting and corrosion resistant finish.

Reflector - extruded high purity aluminum with clear anodized specular finish. All luminaire hardware - stainless steel.

Mounting: S mount - back plate mounts flush to ceiling.

X mount - cantilevers, stems or cables ordered separately. Cantilever - 1" x 2" steel arm, suitable support structure required. Adjustable interface plate (concealed under canopy) allows leveling of arms +/- 5°. Pendant stem - 11/16 O.D. aluminum, internally threaded.

Cable - 1/16" dia. 7x7 aircraft cable, field adjustable length. Hangers at ends of row (or single) are located 2-1/2' (64mm) from end. Intermediate hangers are centered on joint.

REV. 12/02 U.S. Patent D459012. Canadian Patent 93426

Electrical: S mount - 7/8' (22mm) diameter knockouts located at each end of back plate for conduit feed (by others). Use 90°C wire for supply connections and through wire.

X mount - electrical feed hanger mounts over recessed outlet box (by others). Cantilever and stem electrical feeds supplied with #14 AWG leads (must be located at end of row). Cable feed includes 18/3 cord (can be located at end or joint). Housing hinges down for access to ballast and wiring. Optional #14 AWG prewired modular through wiring with quick connectors.

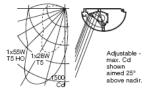
Integral electronic HPF thermally protected class P ballast with end-of-life protection.

Optional electronic dimming ballast dims to 1% of full light output. Compatible dimming control is required (by others). Consult sales representative for specifications.

Optional integral emergency battery operates one lamp. Separate unswitched supply is required.

Standard: UL listed or CSA certified.

Two parabolic reflector sections drive light to the bottom of the vertical surface. An elliptical section redirects light that is normally wasted back to a parabola. Glare is minimized and asymmetry of the beam is maximized resulting in high beam efficiency and superior surface uniformity.



For complete photometrics, visit www.elliptipar.com

elliptipar

w

16.2

To Order



1 Source

F = Linear fluorescent

2 Style

 Xtra small enclosed semi-elliptical, one-way, integral ballast 144

3 Lamp

Note: To order by overall row length, enter ROW CODE in place of Lamp Code below (see Row Charts on page 16-3a). Row Codes specify a row complete with all necessary luminaires and end plates. Hangers are ordered separately.

т		= T5 Fluorescent Lamp Code
		= 15 Fluorescent Lamp Code

Lamp Wattage (see chart below)

Number of Lamps in Length, specify 1 or 2

Example: T155 = 4' (1.2m) housing with one 54W T5HO lamp

	T5	T5HO		
Code	Lamp(s)	Code	Lamp(s)	
	a		в	
T114	1 x F14T5	T124	1 x F24T5/HO	
T121	1 x F21T5	T139	1 x F39T5/HO	
T128	1 x F28T5	T155	1 x F55T5/HO	
T135	1 x F35T5	T180	1 x F80T5/HO	
T221	2 x F21T5	T239	2 x F39T5/HO	
T228	2 x F28T5	T255	2 x F55T5/HO	
	T114 T121 T128 T135 T221	Code Lamp(s) T114 1 × F14T5 T121 1 × F21T5 T128 1 × F28T5 T135 1 × F35T5 T221 2 × F21T5	Code Lamp(s) Code a	

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

4 Mounting

S = Ceiling mount

For use with cantilevers, pendant stems or cable hangers (order separately) x

5 Finish

- 22 = Matte white
- Custom RAL or computer matched color to be specified, consult sales representative 90

REV. 6/06

elliptipar

6 Voltage/Ballast

Electronic

= 120V = 277V = 347V (Canada) 2 3

Project:

- v
- * Consult sales representave for dimming 5' lamps (lamp codes Tx35, Tx80).

Note: When dimming X mount luminaires, order two (2) electrical feeds to accommodate the control circuit.

Max. Row Length per Feed (4' lamps)										
Voltage	Lamp	Cantilever, Stern *	Cable **							
120V	T5	228' (69.5m)	140' (42.7m)							
1200	T5HO	124' (37.8m)	76' (23.2m)							
277V	T5	532' (162.2m)	332' (101.2m)							
2// V	T5HO	296' (90.2m)	184' (56.1m)							

Based on 16A branch circuit capacity (20A max allowed for #14 AWG thru wire). ** Based on 10A capacity of 18/3 cord.

7 Option (See Accessories Section for specifications)

- 00 = No option 0E = Integral emergency battery pack with indicator lamp and test button. Available in 4¹, 5¹, 6² and 8¹ units (lamp codes T128, T135, T221, T228, T155, T239 and T255). Operates one lamp.
 Note: For X mount, order two (2) electrical feed cantilevers, stems or cables to accomodate unswitched feed to battery.
 OK = Prewired modular #14 AWG through wiring with a wirk connected.
- quick connectors.
- quick combination of emergency battery pack and prewired modular through wiring as described above.
 Note: Modular wiring does NOT accomodate unswitched supply to battery. Feed unswitched circuit directly to this unit.
 XX = For modification not listed, include detailed description.
- Consult factory prior to specification.

8 Standard

- 0 = UL. Underwriters Laboratories
- = CSA, Canadian Standards Association

Example

F144 - T155 - X - 22 - T - 000

Xtra small enclosed semi-elliptical, one-way series for use with one 4' F54T5HO lamp, 48' long housing (not including decorative end plates). For use with cantilever, pendant stem or cable hangers (order separately). Matte white, Integral 120V dimming ballast. Vertical straight blade baffles finished matte gray. UL. Order decorative end plates separately.

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

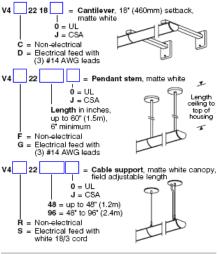
Hangers

Type:

Order separately. See Accessories Section for specifications. Singles - order one non-electrical and one electrical feed hanger for each module (X mount).

Rows - order one non-electrical hanger for each module (X mount) plus one electrical feed for each row. See Voltage/Ballast for maximum row length per electrical feed. Note: For each single or row with dimming (voltage/ballast code T or V) or for each module with emergency battery (option code 0E), order one additional electrical feed and subtract one non-electrical hanger. Cantilever and stem electrical feeds must be located at an

end of row. Cable feed can be located at ends or intermediate joints.



Accessories

Order separately. See Accessories Section for specifications.

ADE44220 = Decorative end plates, pair, matte white, or custom color to match housing (see 5 Finish) Note: adds 1/4" (6mm) to length

ABK = Blank-Out Cover for non-lighted module. Extruded cover replaces baffle, reflector and lamp(s). Painted to match housing. Consult factory for assistance.

The external shapes of the asymmetric reflectors are trademarks of elliptipar. Certain products illustrated may be overed by applicable patents and option of the patent For a list of patents, see Contents pages. These specifications supersede all prior publications and are subject to change without notice. ©2006 elliptipar.

Style 144

Lamp Type F4



Ballast Type F4

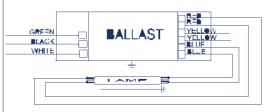


Electrical Specifications

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

Lamp Туре	Num. of Lamp s	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	0.16	19	1.07	20	0.98	1.7	5.63
F14T5	2	14	0/-18	0.29	34	1.06	10	0.98	1.7	3.12
F21T5	1	21	0/-18	0.21	26	1.03	15	0.99	1.7	3.96
F21T5	2	21	0/-18	0.40	48	1.02	10	0.98	1.7	2.13
* F28T5	1	28	0/-18	0.28	33	1.04	10	0.98	1.7	3.15
F28T5	2	28	0/-18	0.55	64	1.03	10	0.99	1.7	1.61
F35T5	1	35	0/-18	0.34	41	1.01	10	0.98	1.7	2.46
F35T5	2	35	0/-18	0.67	80	1.00	10	0.99	1.7	1.25

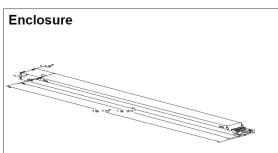
Wiring Diagram



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

Standard Lead Length (inches)

in.	cm.		in.	cm.
0	0	Yellow/Blue	0	0
0	0	Blue/White	0	0
0	0	Brown	0	0
0	0	Orange	0	0
0	0	Orange/Black	0	0
0	0	-	0	0
0	0	Red/White	0	0
	0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 Yellow/Blue 0 0 Blue/White 0 0 Brown 0 0 Orange 0 0 Blue/White 0 0 Orange 0 0 Black/White	0 0 111. 0 0 Yellow/Blue 0 0 0 Blue/White 0 0 0 Brown 0 0 0 Orange 0 0 0 Black/White 0



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 08/21/2006



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

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

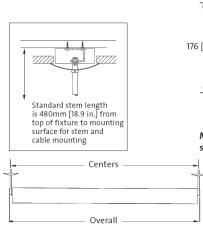
Fixture Type F5

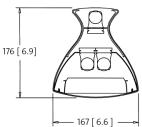
Ordering Guide

Stylus C6 Series Pendant $\left(\right)$

Mounting Information

Nominal	Overall	Centers
Length	mm [in]	mm [in]
4' T5	1235 [48.6]	1219 [48.0]
8' T5	2454 [96.6]	2438 [96.0]
12' T5	3674 [144.6]	3658 [144.0]
4′ T8	1284 [50.6]	1268 [49.9]
8′ T8	2552 [100.5]	2536 [99.8]
12′ T8	3820 [150.4]	3804 [149.8]





Model Shown: specular parabolic louver



Photometrics on reverse

C6	Length	Body/Wings	Light Control Up/Down	Mounting Finish	Source Voltage
B 2 - lamps direct	4 4' long 6 6' long 8	▼ solid P perforated body strip S light slot Wings ✓ X none P* perforated S* solid	Light Control Up U open top C clear dust cover Light Control J solid cross blade baffle	 Mounting solid stem aircraft cable standard 480mm [18.9"] or indicate length 	¥ Source 4 тв 5 т5 6 т5 но
E 1 - lamp direct 1 - lamp indirect	8' long C 12' long R continuous rows	* NOTE: Wings shipped in 4 foot sections on 4-8-12' long bodies and in 3 foot sections on 6' long body.	 Solid cross blade baffle and opal overlay Perforated cross blade baffle Perforated cross blade baffle and opal overlay Specular parabolic louver specular parabolic louver and opal overlay 	Finish W white S special finish: indicate paint # and manufacturer will be matched by Metalumen	Voltage A 120 Volt B 277 Volt C 347 Volt



Approvals

R1-06-03



METALUMEN MANUFACTURING INC. 570 Southgate Drive, Guelph, Ontario N1G 4P6 Mailing Address: P.O. Box 1779, Guelph, Ontario N1H 6Z9 toll free 1-800-621-6785 t 519-822-4381 f 519-822-4589

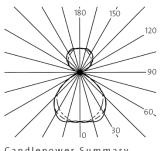
www.metalumen.com

Signature

Date

Photometrics

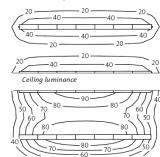
Distribution Curve



Candlepower Summary Angle 0.0 22.5 45 67.5 90 Output

						Lumens
0	1454	1454	1454	1454	1454	8.7
5	1453	1469	1458	1489		131.44
15	1385	1414	1446	1507		412.3
25	1304	1343	1406	1453	1463	646.33
35	1155	1207	1243	1250	1271	771.59
45	929	1003	990	988	994	763.31
55	548	596	591	567	558	517.44
65	33	62	146	219	247	140.7
75	3	3	6	38	60	
85	1	2	1	1	0	0.92
90	2	2	3	3	3	1.44
95	42	40	34	29	31	
105	145	155	133	124		143.74
115	260	296	270	257		267.88
125	375	414	415	401	384	361
135	477	519	539	540		407.55
145	563	601	627	649		388.54
155	641	653	682	692		312.67
165	692	684	699	704		198.11
175	715	718	717	706	697	
180	712	712	712	712	712	4.26

Room Layout



Horizontal footcandles

10.7(L) x 9.1(W) x 3.0(H)m [35 x 30 x 10 ft] Reflectances: 80/50/20 Maintenance factor: 0.70 Fixture spacing: 3.0m [10'-0"] Pendant length: 457mm [18"]

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Luminaire
0-30	1199	13.8	21.4
0-40	1970	22.6	35.2
0-60	3251	37.4	58.2
0-90	3414	39.2	61.1
90-120	441	5.1	7.9
90-130	802	9.2	14.3
90-150	1598	18.4	28.6
90-180	2177	25.0	38.9
0-180	5591	64.3	100.0

Stylus c6 Series

T83Lamps



Photometric report file # C6F4NUK-4 Efficiency 64.3% 38.9% Indirect- 61.1% Direct Model Shown 3-FO32-T8 Lamps (1 up-2 down) Solid body with specular parabolic louver

Coefficients of Utilization Zonal Cavity Method Effective Floor Cavity Reflectance = .20

RC 80 70 50 RW 70 50 30 10 70 50 30 10 50 30 10 RCR 0 70 1 65 2 60 3 55 4 51 5 47 6 43 7 40 8 37 9 34 10 32 70 63 55 49 44 39 35 32 29 27 57 57 57 70 70 66 66 66 57 49 43 37 33 29 26 23 21 19 66
 57
 57

 51
 50

 46
 44

 41
 38

 37
 34

 33
 30

 30
 26

 27
 24

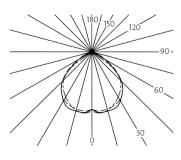
 25
 21

 23
 19

 21
 17
 60 52 45 61 56 51 47 44 40 37 35 32 30 59 52 46 42 37 34 30 28 25 23 58 49 36 31 27 24 21 19 17 55 46 40 34 30 26 23 20 18 16 49 42 36 31 27 24 21 19 17 15 39 34 30 27 24 22

Laboratory results may not be representative of field performance. Ballast factors have not been applied.

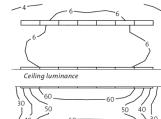
Distribution Curve

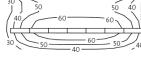


Cand	Su	mma	ary			
Angle	0.0	22.5	45	67.5	90	Output Lumens

0	1423	1423	1423	1423	1423	8.51
5	1400	1474	1471	1480	1505	131.47
15	1400	1423	1444	1473	1504	410.46
25	1282	1329	1394	1434	1461	639.74
35	1126	1207	1256	1250	1256	770.17
45	930	998	993	990	1001	764.09
55	555	604	598	576	555	523.27
65	36	67	150	224	245	144.3
75	3	2	7	39	64	21.55
85	1	1	1	1	0	0.71
90	0	0	0	0	0	0

Room Layout





Horizontal footcandles

10.7(L) x 9.1(W) x 3.0(H)m [35 x 30 x 10 ft] Reflectances: 80/50/20 Maintenance factor: 0.70 Fixture spacing: 3.0m [10'-0"] Pendant length: 457mm [18"]

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Luminaire
0-30	1190	20.5	34.9
0-40	1960	33.8	57.4
0-60	3248	56.0	95.1
0-90	3414	58.9	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	3414	58.9	100.0

194

T8 2 Lamps

24 20



Photometric report file # C6B4NUK-4 Efficiency 58.9% 100 % direct Model Shown 2-FO32 T8 Lamps Solid body with specular parabolic louver

Coefficients of Utilization Zonal Cavity Method Effective Floor Cavity Reflectance = .20

RC		8	0			7	0			50	
RW	70	50	30	10	70	50	30	10	50	30	10
RCR											
0	70	70	70	70	68	68	68	68	65	65	65
1	65	63	61	59	64	62	60	58	59	58	56
2	60	56	53	50	59	55	52	50	53	51	49
3	56	50	46	43	54	50	46	43	48	45	42
4	51	45	41	37	50	45	40	37	43	40	37
5	47	41	36	33	46	40	36	33	39	35	32
6	44	37	32	29	43	36	32	29	35	31	28
7	41	34	29	26	40	33	29	25	32	28	25
8	38	31	26	23	37	30	26	23	30	26	23
9	36	28	24	21	35	28	24	21	27	23	20
10	33	26	22	19	33	26	21	19	25	21	19

Laboratory results may not be representative of field performance. Ballast factors have not been applied.

Pendant



Lamp Type F5

	Product Number:	20904
	Order Abbreviatio	n: FP54/835/HO/ECO
Franking and Andrews	General Description:	54W, T5 PENTRON high output (HO) fluorescent lamp, 3500K color temperature, rare earth phosphor, 85 CRI, ECOLOGIC
	Product Inform	ation
Abbrev. With Packaging Info.	FP54	835HOECO 40/CS 1/SKU
Actual Length (in)	45.8	
Actual Length (mm)	1163	.2
Average Rated Life (hr)	2500	0
Base	Minia	ture Bipin
Bulb	T5	
Color Rendering Index (CRI)	85	
Color Temperature/CCT (K)	3500	
Diameter (in)	0.67	
Diameter (mm)	17.0	
Family Brand Name	PENT	RON® ECO®
Initial Lumens at 25C	4450	
Initial Lumens at 35C	5000	
Mean Lumens at 25C	4138	
Mean Lumens at 35C	4650	
Nominal Length (in)	48	

Ballast Type F5

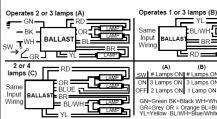


Electrical Specifications

ICN4S5490C2LS@120										
CENTIUM T5										
Electronic										
Programmed Start										
Series/Parallel										
120										
50/60 HZ										
Active										

Lamp Type	Num. of Lamp s	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.
* F54T5/HO	1	54	-20/-29	0.52	62	0.99	15	0.98	1.7	1.60
F54T5/HO	2	54	-20/-29	0.99	118	0.99	10	0.98	1.7	0.84
F54T5/HO	3	54	-20/-29	1.52	182	1.00	10	0.98	1.7	0.55
F54T5/HO	4	54	-20/-29	2.00	240	1.00	10	0.98	1.7	0.42

Wiring Diagram



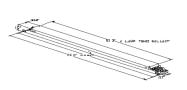
BL/WH RD = (A) (B) (C) # Lamps ON 4 Lamps ON amp # Lamps C 3 Lamps C 3 Lamps ON OFF 2 Lamps ON 1 Lamp ON 2 Lamps ON GN=Green BK=Black WH=WhiRD=Red GR=Grey OR = Orange BL=Blue BR=Brown YL=Yellow BL/WH=Blue/White

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

Standard Lead Length (inches)

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

Enclosure



Enclosure Dimensions

0	OverAll (L)	Width (W)	Height (H)	Mounting (M)
	24 "	1.18 "	1 "	23.64 "
	24	1 9/50	1	23 16/25
	61 cm	3 cm	2.5 cm	60 cm



Revised 01/31/2007

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

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

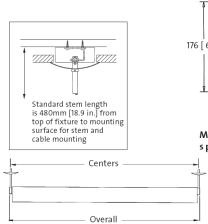
Fixture Type F6

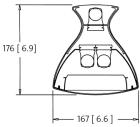
Ordering Guide

Stylus C6 Series Pendant $\left| \right| \left| \right\rangle$

Mounting Information

Nominal	Overall	Centers		
Length	mm [in]	mm [in]		
4' T5	1235 [48.6]	1219 [48.0]		
8' T5	2454 [96.6]	2438 [96.0]		
12' T5	3674 [144.6]	3658 [144.0]		
4′ T8	1284 [50.6]	1268 [49.9]		
8′ T8	2552 [100.5]	2536 [99.8]		
12′ T8	3820 [150.4]	3804 [149.8]		





Model Shown: specular parabolic louver



Photometrics on reverse

Series Model	Length	Body/Wings	Light Control Up/Down	Mounting Finish	Source Voltage
A 1 - lamp direct B 2 - lamps direct C 1 - lamp direct 1 - lamp indirect F 2 - lamps direct 1 - lamp direct 1 - lamp indirect	4 'long 6 'long 8 'long C 12'long R continuous rows	 N solid P perforated body strip S light slot Wings X none P* perforated S* solid * NOTE: Wings shipped in 4 foot sections on 4-8-12' long bodies and in 3 foot sections on 6' long body. 	Light Control Up U open top C clear dust cover Light Control J solid cross blade baffle O solid cross blade baffle and opal overlay L perforated cross blade baffle M perforated cross blade baffle and opal overlay K specular parabolic louver Z specular parabolic louver and opal overlay	Mounting solid stem aircraft cable standard 480mm [18.9"] or indicate length Finish W white S special finish: indicate paint # and manufacturer will be matched by Metalumen 	Source 4 T8 5 T5 6 T5 HO Voltage A 120 Volt B 277 Volt C 347 Volt
I I		1			P1 06 03



Approvals

R1-06-03



METALUMEN MANUFACTURING INC. 570 Southgate Drive, Guelph, Ontario N1G 4P6 Mailing Address: P.O. Box 1779, Guelph, Ontario N1H 6Z9 toll free 1-800-621-6785 t 519-822-4381 f 519-822-4589

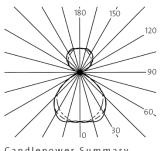
www.metalumen.com

Signature

Date

Photometrics

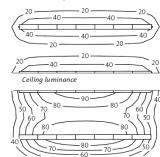
Distribution Curve



Candlepower Summary Angle 0.0 22.5 45 67.5 90 Output

						Lumens
0	1454	1454	1454	1454	1454	8.7
5	1453	1469	1458	1489		131.44
15	1385	1414	1446	1507		412.3
25	1304	1343	1406	1453	1463	646.33
35	1155	1207	1243	1250	1271	771.59
45	929	1003	990	988	994	763.31
55	548	596	591	567	558	517.44
65	33	62	146	219	247	140.7
75	3	3	6	38	60	
85	1	2	1	1	0	0.92
90	2	2	3	3	3	1.44
95	42	40	34	29	31	
105	145	155	133	124		143.74
115	260	296	270	257		267.88
125	375	414	415	401	384	361
135	477	519	539	540		407.55
145	563	601	627	649		388.54
155	641	653	682	692		312.67
165	692	684	699	704		198.11
175	715	718	717	706	697	
180	712	712	712	712	712	4.26

Room Layout



Horizontal footcandles

10.7(L) x 9.1(W) x 3.0(H)m [35 x 30 x 10 ft] Reflectances: 80/50/20 Maintenance factor: 0.70 Fixture spacing: 3.0m [10'-0"] Pendant length: 457mm [18"]

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Luminaire
0-30	1199	13.8	21.4
0-40	1970	22.6	35.2
0-60	3251	37.4	58.2
0-90	3414	39.2	61.1
90-120	441	5.1	7.9
90-130	802	9.2	14.3
90-150	1598	18.4	28.6
90-180	2177	25.0	38.9
0-180	5591	64.3	100.0

Stylus c6 Series

Pendant

T83Lamps



Photometric report file # C6F4NUK-4 Efficiency 64.3% 38.9% Indirect- 61.1% Direct Model Shown 3-FO32-T8 Lamps (1 up-2 down) Solid body with specular parabolic louver

Coefficients of Utilization Zonal Cavity Method Effective Floor Cavity Reflectance = .20

RC 80 70 50 RW 70 50 30 10 70 50 30 10 50 30 10 RCR 0 1 2 3 4 5 6 7 70 63 55 49 44 39 35 32 29 27 57 57 57
 0
 70

 1
 65

 2
 60

 3
 55

 4
 51

 5
 47

 6
 43

 7
 40

 8
 37

 9
 34

 10
 32
 70 70 66 66 66 57 49 43 37 33 29 26 23 21 19 66
 57
 57

 51
 50

 46
 44

 41
 38

 37
 34

 33
 30

 30
 26

 27
 24

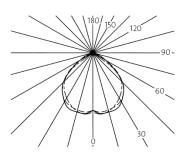
 25
 21

 23
 19

 21
 17
 60 52 45 61 56 51 47 44 40 37 35 32 30 59 52 46 42 37 34 30 28 25 23 58 49 36 31 27 24 21 19 17 55 46 40 34 30 26 23 20 18 16 49 42 36 31 27 24 21 19 17 15 39 34 30 27 24 22

Laboratory results may not be representative of field performance. Ballast factors have not been applied.

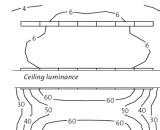
Distribution Curve

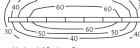


Cand	lep	ower	Su	ı m m a	ary	
Angle	0.0	22.5	45	67.5	90	Output Lumens

0	1423	1423	1423	1423	1423	8.51
5	1400	1474	1471	1480	1505	131.47
15	1400	1423	1444	1473	1504	410.46
25	1282	1329	1394	1434	1461	639.74
35	1126	1207	1256	1250	1256	770.17
45	930	998	993	990	1001	764.09
55	555	604	598	576	555	523.27
65	36	67	150	224	245	144.3
75	3	2	7	39	64	21.55
85	1	1	1	1	0	0.71
90	0	0	0	0	0	0

Room Layout





Horizontal footcandles

10.7(L) x 9.1(W) x 3.0(H)m [35 x 30 x 10 ft] Reflectances: 80/50/20 Maintenance factor: 0.70 Fixture spacing: 3.0m [10'-0"] Pendant length: 457mm [18"]

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Luminaire
0-30	1190	20.5	34.9
0-40	1960	33.8	57.4
0-60	3248	56.0	95.1
0-90	3414	58.9	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	3414	58.9	100.0

T8 2 Lamps

24 20



Photometric report file # C6B4NUK-4 Efficiency 58.9% 100 % direct Model Shown 2-FO32 T8 Lamps Solid body with specular parabolic louver

Coefficients of Utilization Zonal Cavity Method Effective Floor Cavity Reflectance = .20

RC		80		70					80 70				80 70					50	
RW	70	50	30	10	70	50	30	10	50	30	10								
RCR																			
0	70	70	70	70	68	68	68	68	65	65	65								
1	65	63	61	59	64	62	60	58	59	58	56								
2	60	56	53	50	59	55	52	50	53	51	49								
3	56	50	46	43	54	50	46	43	48	45	42								
4	51	45	41	37	50	45	40	37	43	40	37								
5	47	41	36	33	46	40	36	33	39	35	32								
6	44	37	32	29	43	36	32	29	35	31	28								
7	41	34	29	26	40	33	29	25	32	28	25								
8	38	31	26	23	37	30	26	23	30	26	23								
9	36	28	24	21	35	28	24	21	27	23	20								
10	33	26	22	19	33	26	21	19	25	21	19								

Laboratory results may not be representative of field performance. Ballast factors have not been applied.

Lamp Type F6



Ballast Type F6

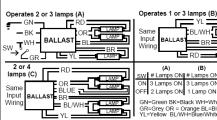


Electrical Specifications

C2LS@120
CENTIUM T5
Electronic
Programmed Start
Series/Parallel
120
50/60 HZ
Active

Lamp Type	Num. of Lamp s	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.
* F54T5/HO	1	54	-20/-29	0.52	62	0.99	15	0.98	1.7	1.60
F54T5/HO	2	54	-20/-29	0.99	118	0.99	10	0.98	1.7	0.84
F54T5/HO	3	54	-20/-29	1.52	182	1.00	10	0.98	1.7	0.55
F54T5/HO	4	54	-20/-29	2.00	240	1.00	10	0.98	1.7	0.42

Wiring Diagram



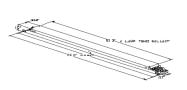
BL/WH RD = (A) (B) (C) # Lamps ON 4 Lamps ON amp # Lamps C 3 Lamps C 3 Lamps ON OFF 2 Lamps ON 1 Lamp ON 2 Lamps ON GN=Green BK=Black WH=WhiRD=Red GR=Grey OR = Orange BL=Blue BR=Brown YL=Yellow BL/WH=Blue/White

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)
24 "	1.18 "	1 "	23.64 "
24	1 9/50	1	23 16/25
61 cm	3 cm	2.5 cm	60 cm



Revised 01/31/2007

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

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

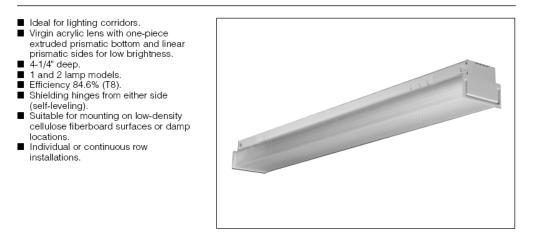
Corporate Offices: Phone: 800-322-2086

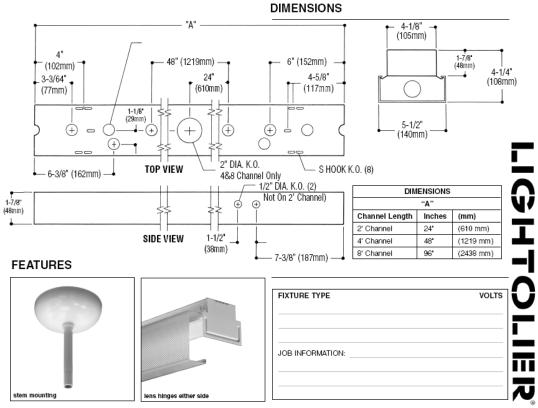
Fixture Type F7

JS SERIES 5-1/2" WIDE

JETSTAR

CORRIDOR LUMINAIRE 5-1/2" WIDTH, 24', 48", 96" NOMINAL LENGTHS 1 OR 2 LAMP, T8 OR T12





SECTION 3A/Folio H96-10

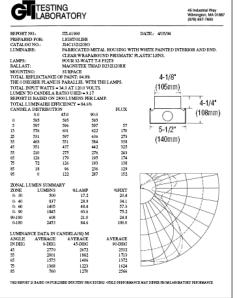
JS SERIES 5-1/2" WI JETSTAR D CORRIDOR LUMINAIRE

PHOTOMETRY

MODEL NO. JS4C132120SO

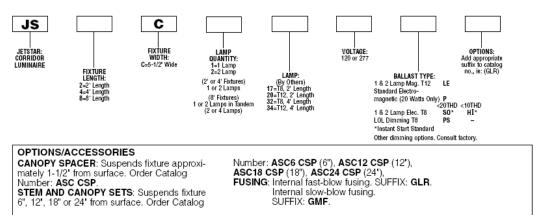
LER = FW - 72.0 Watts - 34 BF - 1.0

Comparative yearly lighting energy cost per lumens. = \$3.33



	-		-	avity method			r cavity reflectance 0.20)
RF		20			20		20
RC		80			50		30
BW	70	50	30	50	30	10	50 30 10
1	86	82	78	70	68	65	64 62 60
· <u>S</u> 2	78	71	66	62	57	54	56 52 49
c atio	72	63	56	54	49	45	49 45 42
	66	56	48	48	43	39	44 40 36
4 5 6	60	50	42	43	38	34	40 35 31
86	56	45	38	39	34	29	36 31 28
§ 7	52	41	33	36	30	26	33 28 24
502 B	48	37	30	33	27	23	30 25 22
9	45	34	27	30	25	21	28 23 20
10	42	31	25	28	22	19	26 21 18

ORDERING INFORMATION Explanation of Catalog Number. Example: JS4C132120SOGLR



SPECIFICATIONS:

PERFORMANCE: In an installation of 1 lamp 40W luminaires in a room cavity ratio of 1, with reflectance of 80% ceiling, 50% wall, 20% floor, the C.U. shall not be less than .82. To reduce glare the average bright-ness at 65° shall not exceed 1575 footlamberts. To control veiling reflections, luminaire output in the 30°-90° zone shall be not less than 46.4%

MATERIALS: Chassis parts are die-formed code gauge cold rolled steel. Housing is reinforced for rigidity. Refractor-one-piece virgin acrvlic.

FINISH: Chassis exterior-white baked polyester enamel. Cavity-white baked polyester enamel minimum 86% reflectance. Phosphate under-coating. LENS: One-piece extruded prismatic pattern 12 bottom and linear prism

side walls.

Side wais.
ELECTRICAL: Thermally protected class "P" ballast C.B.M. approved, non PCB. If K.O. is within 3" of ballast, use wire suitable for at least 90°.
LABELS: I.B.E.W./UL and C-UL.



Lamp Type F7

	Product Number:	21779
and the second second	Order Abbreviation:	F032/835/EC0
Rammer & Control of Co	General Description:	32W, 48" MOL, T8 OCTRON fluorescent lamp, 3500K color temperature, rare earth phosphor, 82 CRI, suitable for IS c RS operation, ECOLOGIC
	Product Inform	nation
Abbrev. With Packaging Info.	F	F032835EC0 30/CS 1/SKU
Actual Length (in)	4	+7.78
Actual Length (mm)	:	1213.6
Average Rated Life (hr)	3	30000
Base	١	Aedium Bipin
Bulb	٦	18
Color Rendering Index (CRI)	8	32
Color Temperature/CCT (K)	3	3500
Diameter (in)	:	1.10
Diameter (mm)	2	27.9
Family Brand Name	(Octron® 800, Ecologic
Industry Standards	Å	NSI C78.81 - 2001
Initial Lumens at 25C	2	2950
Mean Lumens at 25C	2	2710
Nominal Length (in)	4	48
Norminal Eerigen (m)		

Ballast Type F7

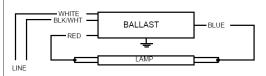


Electrical Specifications

RCN-1P32-SC				
Brand Name	CENTIUM			
Ballast Type	Electronic			
Starting Method	Instant Start			
Lamp Connection	Parallel			
Input Voltage	120			
Input Frequency	50/60 HZ			
Status	Active			

Lamp Type	Num. of Lamp s	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.
F17T8	1	17	0/-18	0.18	20	0.92	20	0.93	1.7	4.60
F25T8	1	25	0/-18	0.22	27	0.92	10	0.98	1.7	3.41
* F32T8	1	32	0/-18	0.27	32	0.92	10	0.99	1.7	2.88

Wiring Diagram



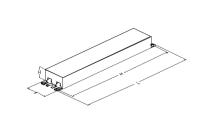
Diag. 63

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

Standard Lead Length (inches)

	1	-			
	in.	cm.		in.	cm
Black			Yellow/Blue		
White	25.0		Blue/White		
Blue	31.0		Brown		
Red	37.0		Orange		
Yellow			Orange/Black		
Gray			Black/White	25.0	
Violet			Red/White		

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 08/26/2002

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.

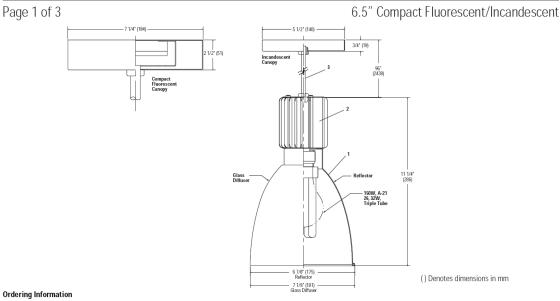
ADVANCE

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

Appendix A-1

Fixture Type A1

Decorative Performance Pendalyte **406**



Power Head and Suspension: Titanium Finish						
Catalog No.	Lamp	Watts	Volts	Suspension		
406U2	CFL Triple Tube	26/32	120/277	Straight Cord		
406151	Incandescent A21	150	120	Straight Cord		

Ref	lector/	G	ass

Reflectof/Glass	
Catalog No.	Description
416SR	Satin Aluminum Reflector
416WH	White Glass
416BL	Cobalt Blue Glass
416AB	Amber Glass

Features

- 2. Power Head Housing: One-piece extruded aluminum.
- 3. Suspension: Power Cord, SJT/18-3 (incandescent), SJT/18-5 (Compact Fluorescent) black finish. Canopy, 20 gage, .036 CRS, titanium finish. Can be field shortened.

Lamping (by others) Incandescant: 150W, A-21

Compact Fluorescent: Universal for 4-Pin, 26/32 watt, base: GX24q-3

General Electric	Osram/Sylvainia	Philips
------------------	-----------------	---------

(1) 26W Triple Tube 4-Pin (Amalgam) Compact Fluorescent Lamp					
F26TBX/*/A/4P CF26DT/E/IN/* PL-T26W/*/4P					
(1) 32W Triple Tube 4-Pin (Amalgam) Compact Fluorescent Lamp					
F32TBX/*/A/4P CF32DT/E/IN/* PL-T32W/*/4P					

* Manufacturers' color temperature designation

Electrical

Lampholders:

Incandescent: Medium Based, Porcelain, Nickel-Plated Screw Shell Compact Fluorescent: 4-pin, 26/32 watt base: GX24Q-3 Ballast: Fluorescent: Electronic

	26	Watt	32 Watt		
Voltage	120	277	120	277	
Total Input Watts	28	28	36	36	
Max. Line Current (Amps)	.25	.11	.30	.09	
Ballast Factor	1.02	1.02	1.00	1.00	

THD<10%, Minimum Starting Temperature: 0°F Power Factor >0.98

Labels

cULus listed suitable for damp locations.

Job Information Type:

Job Name: Cat. No.:

Lamp(s):

Notes:

www.lightolier.com Lightolier a Genlyte company www.lightolier.co 631 Airport Road, Fall River, MA 02720 • (508) 679-8131 • Fax (508) 674-4710 We reserve the right to change details of design, materials and finish. © 2004 Genlyte Group LLC • C0605



^{1.} Reflector System:

Reflector: High purity, 16 gauge aluminum. Exterior satined and anodized. Interior low iridescent comfort clear anodized.

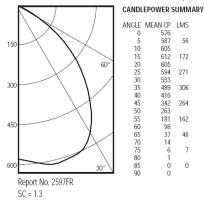
Glass Diffusers: Pressed colored glass with soft etched exterior and matte white interior fritt.

Decorative Performance Pendalyte **406**

Page 2 of 3

6.5" Compact Fluorescent/Incandescent

Satin Aluminum Reflector Catalog No. 406U2 / 416SR, 32W CFL, 2400 Lumens.



ZONAL LUMENS AND PERCENTAGES										
ZONE	LUMENS	% LAMP	%LUMINAIRE							
0-30	500	20.84	38.92							
0-40	806	33.58	62.72							
0-60	1231	51.32	95.84							
0-90	1285	53.55	100.00							
40-90	479	19.96	37.28							
60-90	53	2.23	4.16							
90-180	0	.00	.00							
0-180	1285	53.55	100.00							
	** EFFICI	ENCY = 53.	5% **							

COEFFICIENTS OF UTILIZATION

Ce	iling		80)%		709	%	50	1%	30)%	
W	all	70	50	30	10	50	10	50	10	50	10	0
RC	R	Zoi	nal C	avity	Meth	iod - Ef	ffect	ive Flo	oor Re	flecta	ince =	20%
	0	.64	.64	.64	.64	.62	.62	.59	.59	.57	.57	.54
	1	.60	.58	.57	.56	.57	.55	.55	.53	.53	.51	.49
	2	.57	.54	.51	.49	.53 .	.48	.51	.47	.49	.46	.44
	3	.53	.49	.46	.43	.48	.43	.47	.42	.45	.41	.40
	4	.50	.45	.41	.39	.44 .	.38	.43	.38	.42	.37	.36
.9	5	.46	.41	.37	.34	.40	.34	.39	.34	.38	.33	.32
Ra	6	.43	.37	.33	.31	.37	.30	.36	.30	.35	.30	.29
ξ	7	.40	.34	.30	.27	.33 .	.27	.33	.27	.32	.26	.25
NB)	8	.37	.31	.27	.24	.30	.24	.30	.24	.29	.24	.23
E	9	.34	.28	.24	.21	.28	.21	.27	.21	.27	.21	.20
Room Cavity Ratio	10	.32	.26	.22	.19	.25	.19	.25	.19	.24	.19	.18

Determined In Accordance With Current IES Published Procedures Luminaire Imput Watts = 33.0

White Glass Reflector Catalog No. 406U2 / 416WH, 32W CFL, 2400 Lumens.

114

119

117

107

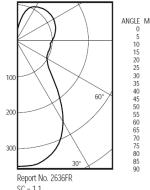
91

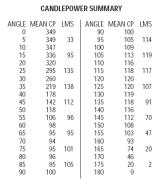
70

47

20

2





ZONAL LUMENS AND PERCENTAGES										
ZONE	LUMENS	% LAMP	%LUMINAIRE							
0-30	263	10.98	16.47							
0-40	401	16.71	25.06							
0-60	609	25.39	38.08							
0-90	910	37.94	56.90							
40-90	509	21.23	31.83							
60-90	301	12.55	18.81							
90-180	689	28.74	43.10							
0-180	1600	66.68	100.00							
	** EFFICI	ENCY = 66.	7% **							
	ZONE 0-30 0-40 0-60 0-90 40-90 60-90 90-180	ZONAL LUMENS 0.30 263 0.40 401 0.60 609 0.90 910 40.90 509 60.90 301 90.180 689 0.180 1600	ZONAL LUMENS AND PEI ZONE LUMENS % LAMP 0-30 263 10.98 0-40 401 16.71 0-60 609 25.39 0-90 910 37.94 40-90 509 21.23 60-90 301 12.55 90-180 689 28.74							

COEFFICIENTS OF UTILIZATION

Ce	iling		80	1%		70)%	50)%	30)%	
W	all	70	50	30	10	50	10	50	10	50	10	0
R	CR	Zor	nal C	avity	Meth	iod - E	ffect	ive Flo	oor Re	flecta	nce =	20%
	0	.73	.73	.73	.73	.68	.68	.58	.58	.50	.50	.38
	1	.65	.62	.58	.56	.57	.52	.49	.45	.42	.49	.29
	2	.59	.54	.49	.45	.50	.46	.43	.37	.37	.32	.24
	3	.54	.47	.42	.38	.44	.36	.38	.32	.32	.27	.21
	4	.50	.42	.37	.33	.40	.31	.34	.27	.29	.24	.18
9	5	.46	.38	.32	.28	.35	.27	.31	.24	.27	.21	.16
coom Cavity Ratio	6	.42	.34	.29	.25	.32	.23	.28	.21	.24	.19	.14
₹	7	.39	.31	.25	.22	.29	.21	.25	.19	.22	.16	.13
S.	8	.36	.28	.23	.19	.26	.18	.23	.17	.20	.15	.12
ε	9	.34	.26	.21	.17	.24	.16	.21	.15	.19	.13	.10
8	10	.32	.24	.19	.15	.22	.15	.20	.13	.17	.12	.09

Determined In Accordance With Current IES Published Procedures Luminaire Imput Watts = 31.0

SC = 1.1

Amber Glass Reflector Catalog No. 406U2 / 416AB, 32W CFL, 2400 Lumens. CANDLEPOWER SUMMARY

38

108

153

152

111

73

48

29

14

90 95 100

105 110

115

120 125 130

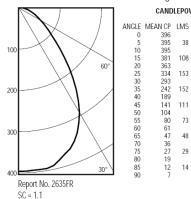
9

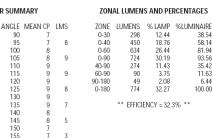
9

6 53

1

0 1 Ω





COEFFICIENTS OF UTILIZATION

Ceiling	80%	70%	50%	30%					
Wall	70 50 30 10	50 10	50 10	50 10	0				
RCR	Zonal Cavity Met	, hod - Effect	ive Floor Re	flectance =	20%				
0	.38 .38 .38 .38 .35 .34 .33 .32	.37 .37 .33 .31	.35 .35 .32 .30	.33 .33 .30 .29	.30 .27				
2	.33 .31 .29 .28	.30 .27	.32 .30	.28 .26	.24				
3	.31 .28 .26 .24	.27 .24	.26 .23	.25 .23	.21				
	.29 .26 .24 .22	.25 .22	.24 .21	.23 .21	.19				
.e 5	.27 .24 .21 .19	.23 .19	.22 .19	.21 .18	.18				
6 Kat	.25 .22 .19 .18	.21 .17	.20 .17	.20 .17	.16				
£ 7	.23 .20 .17 .16	.19 .16	.19 .15	.18 .15	.14				
<u>₹</u> 8	.22 .18 .16 .14	.18 .14	.17 .14	.17 .14	.13				
ε 9	.20 .17 .14 .13	.16 .13	.16 .13	.15 .12	.12				
Room Cavity Ratio 01 6 8 2 9 5	.19 .15 .13 .12	.15 .12	.15 .11	.14 .11	.11				
2 10 .19 .15 .13 .12 .15 .11 .14 .11 .11 Determined In Accordance With Current IES Published Procedures Luminaire Imput Watts = 31.0 Notes: Amber Glass and Cobalt Blue Glass have the same Photometrics. For 26W Lamp, multiply calculated Footcandle values by .75									

Job Information

38.54 58.14 81.94 93.56

35.42

11.63

6.44 100.00

Type:

Lightolier a Genlyte company www.lightolier.com 631 Airport Road, Fall River, MA 02720 • (508) 679-8131 • Fax (508) 674-4710 We reserve the right to change details of design, materials and finish. © 2004 Genlyte Group LLC • C0605



Lamp A1



Product Number: 20885

Order CF32DT/E/IN/835/ECO Abbreviation:

General Description:

DULUX 32W triple compact fluorescent amalgam lamp with 4-pin base, integral EOL, 3500K color temperature, 82 CRI, for us with electronic and dimming ballasts, ECOLOGIC

Product Information								
Abbrev. With Packaging Info.	CF32DTEIN835ECO 50/CS 1/SKU							
Average Rated Life (hr)	12000							
Base	GX24Q-3							
Bulb	T (T4)							
Color Rendering Index (CRI)	82							
Color Temperature/CCT (K)	3500							
Family Brand Name	Dulux® T/E							
Industry Standards	IEC 60901- 7432							
Initial Lumens at 25C	2328							
Mean Lumens at 25C	2002							
Maximum Overall Length - MOL (in)	5.6							
Maximum Overall Length - MOL (mm)	142							
NEMA Generic Designation (current)	CFTR32W/GX24Q/835							
NEMA Generic Designation (old)	CFM32W/GX24Q/835							
Nominal Wattage (W)	32.00							



Electrical Specifications

IZT-1T42-M2-BS@120

MARK 7 0-10V
Electronic Dimming
Programmed Start
Series
120-277
50/60HZ
Active

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.
CFM26W/GX24Q	1	26	50/10	0.25	08/29	0.05/1.00	14	0.95	1.4	3.45
* CFM32W/GX24Q	1	32	50/10	0.33	09/39	0.05/1.00	10	0.97	1.4	2.56
CFM42W/GX24Q	1	42	50/10	0.42	09/50	0.05/1.00	10	0.98	1.4	2.00
CFQ26W/G24Q	1	26	50/10	0.25	08/29	0.05/1.00	14	0.95	1.4	3.45

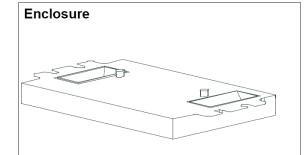


Green Terminal must be Grounded

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

Standard Lead Length (inches)

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



Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
4.98 "	3.00 "	1.29 "	2.00 "
4 49/50	3	1 29/100	2
12.6 cm	7.6 cm	3.3 cm	5.1 cm

Revised 06/18/2003



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

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

Fixture Type A2

Job	Name:	

Type:

Order Number:

236 Series 12V PAR36/AR111

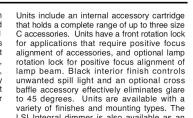


The 236 Series Spotlight is a specification grade medium and long throw unit designed for all of the low voltage PAR36 and AR111 energy conserving screw terminal lamps. Its clean architectural styling makes it the perfect unit for interior spaces such as museums, galleries, exhibits, malls and boutiques, residences and similar areas where a visually quiet, high-intensity light is needed. This unit features a low profile electronic tansformer integrated into the fitting.

This unit with its unique snap-in socket easily accepts both PAR36 and AR111 lamps, up to 75 watts.

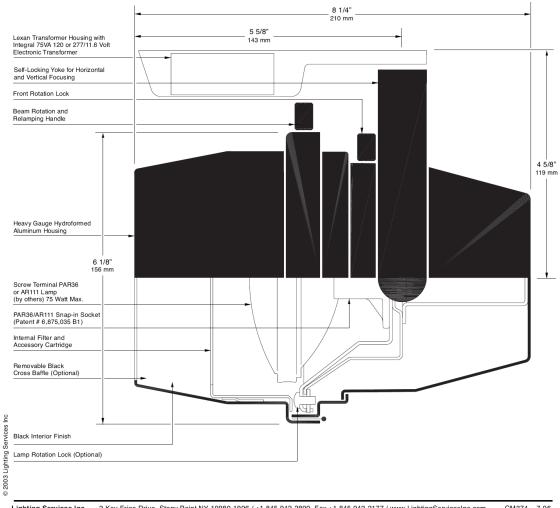
cULus Listed/CE Certified USA Manufactured/IBEW

236-00 (120V) V236-00 (277V)



LSI Integral dimmer is also available as an accessory for intensity control.

Protected under Patent # 6,875,035 B1





Job Name:

Туре

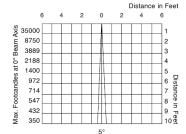
236 Series 12V PAR36/AR111

5°

Photometric Data 4

50PAR36/H/SP5° 50 watt/12 volt Spot/3050K Beam Spread to 50% of CBCP

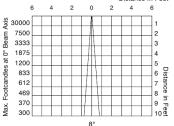
Center Beam Candlepower 35000



75AR111/8/SP 75 watt/12 volt

Spot/3000K Beam Spread to 50% of CBCP Center Beam Candlepower





Lamp Type

35PAR36/H/SP5° 35watt/12v, 4000 hours BeamSpread to 50% of CBCF 25000 Center Beam Candlepower Color Temperature 3050K

35PAR36/H/SP8° 35watt/12v, 4000 hours BeamSpread to 50% of CBCP Center Beam Candlepower 200 8 20000 Color Temperature 3050K

35PAR36/H/FL30° 35watt/12v, 4000 hours BeamSpread to 50% of CBCP Center Beam Candlepower 905 30 900 Color Temperature 3050K

50PAR36/H/SP5° 50watt/12v, 4000 hours BeamSpread to 50% of CBCP 5 Center Beam Candlepower Color Temperature 35000 3050K

50PAR36/H/SP8° 50watt/12v, 4000 hours BeamSpread to 50% of CBCP Center Beam Candlepower 30000 Color Temperature 3050K

50PAR36/H/FL30° 50watt/12v, 4000 hours BeamSpread to 50% of CBCP ່ 30° Center Beam Candlepower 1300 Color Temperature 3050K

50AR111/4/SSP 50watt/12v, 3000 hours BeamSpread to 50% of CBCP Center Beam Candlepower 30000 Color Temperature 3000K 50AR111/8/SP 50watt/12v. 3000 hours BeamSpread to 50% of CBCP 23000 Center Beam Candlepower Color Temperature 3000K

50AR111/25/FL 50watt/12v, 3000 hours BeamSpread to 50% of CBCP Center Beam Candlepower 25° 4000 Color Temperature 3000K

75AR111/8/SP 75watt/12v, 3000 hours 8° BeamSpread to 50% of CBCP Center Beam Candlepower 30000 Color Temperature 3000K

75AR111/25/FL 75watt/12v, 3000 hours BeamSpread to 50% of CBCP 25° Center Beam Candlepower 5300 Color Temperature 3000K

75AR111/45/WFL 75watt/12v, 3000 hours BeamSpread to 50% of CBCP 45° 1700 Center Beam Candlepower Color Temperature 3000K

Accessories

8°

30000

Louver C

1/2" cellular metal louver, controls spill light and glare, 45° cutoff.

Cross Baffle 236

1 3/4" deep internal cross baffle, controls spill light and glare, black.

Glass Color Filters, Size C

Selection of 95 permanent rimmed dichroic, and rimmed and slotted standard colors.

Spread Lens C990

Permanent glass for spreading light beam in one axis, 5° X 50°, rimmed and slotted for heat expansion.

Spread Lens C992

Permanent molded glass lens for spreading light beam in one axis-nominal 5°X 30°.

Spread Lens C995

Permanent molded glass lens for spreading light beam in all directions-nominal 50° X 50°.

Spread Lens C996 Permanent molded glass lens for spreading light beam slightly more in one direction than the other-nominal 45° X 50°.

Beam Softener C998

8

4

Permanent glass lens for conditioning light to create a softer beam.

OPTIVEX[™] UV Blocking Filter C962

Eliminates ultra-violet wavelengths below 410±10nm. Especially useful for conservation of artworks and to help prevent fading.

Light Blocking Screens, Size C C801S-20% Light Blocking, C802S-30% Light Blocking, C803S-40% Light Blocking Stainless Steel Screens. Used individually or in combination to reduce transmitted light without changing its color temperature.

Integral Dimmer For 120 Volt Yoke Mounted Dimmer add Suffix "D" to model number.



Ordering Information Model Number add prefix V for 277 Volt add suffix letters for finish

236-00⁵ Lexan Fitting for 1 and 2 circuit I SI Track With switch

236-3G

236-5E

boxes.

O.D. With switch, fuse and 6-foot

3-wire grounding

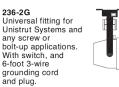
cord and plug.

on standard 4"

octagonal outlet

Order Number

8°







Lamp Locking

For permanent locking of lamp rotation, add suffix "RL" to model number. (example: 236RL-00)

Coiled Cord

18/3 105°C, 18" retracted, 6 foot extended. Specify by adding suffix **CC** to model number. White fixture supplied with white cord, all other finishes supplied with black cord.

Wrench Locking For permanent locking of fixture position, add suffix "WL" to model number.

Finishes (Paint	Finis	hes	(Pa	int
-----------------	-------	-----	-----	-----

(suffix B) Black White (suffix W) Silver (suffix S) Graphite (suffix G) Platinum (suffix P

Notes: 1. CBCP = Center Beam Candlepower 2. K = Color Temperature in Kelvin degrees 3. OPTIVEX= glass is a trademark of Bausch & Lomb Inc. 4. Lamp manufacturer's published data 5. Not for use with Unimount or Emergency/Worklite track

Lighting Services Inc 2 Kay Fries Drive, Stony Point NY 10980-1996 / +1 845 942-2800 Fax +1 845 942-2177 / www.LightingServicesInc.com CM374 7-06

Lamp A2



Product Number: 55017

Order Abbreviation: 50PAR36/HAL/WFL30 12V

General Description: Tungsten Halogen CAPSYLITE PAR36 Screw Terminal <(>&<)> Spade Connector Base 50Watt 12Volt Wide Flood Beam

	Product Information
Abbrev. With Packaging Info.	50PAR36HALWFL3012V 12/CS 1/SKU
Approx. Lumens	700
Average Rated Life (hr)	4000
Base	Screw Terminal
Beam Angle (deg)	20
Beam Type	WFL
Bulb	PAR36
Centerbeam Candlepower (cp)	1400
Class	С
Diameter (in)	4 1/2
Diameter (mm)	114
Ecologic	Yes
Family Brand Name	CAPSYLITE® PAR36
Filament	C-8
Horizontal Beam Angle (deg)	30
Lamp Finish	Reflector
Maximum Overall Length - MOL (in)	2.750
Maximum Overall Length - MOL (mm)	70
Nominal Voltage (V)	12.00
Nominal Wattage (W)	50.00
Vertical Beam Angle (deg)	20

Fixture Type A3

Type:_

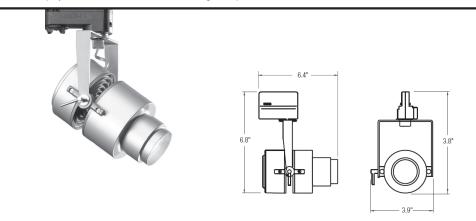
Project: _

TARGETTI

Foho Pro

MR16 Projector

Professional directional projector for use with an 50W MR16 Halogen lamp.



Details

Features

- Die-cast aluminum joints, fitted with graduated ring for tool-less aim locking
- Painted aluminum body with die-cast titanium-colored painted supports
- Mounts to wall, ceiling or track
- 359° horizontal rotation and 90° vertical tilt, with directional locking (90° locks in position)
- 120V electronic transformer separate from the optical assembly to optimize heat dispertion and ensure the lamp maintains a constant operating temperature

TARGETTI a division of TARGETTI NORTH AMERICA 1513 E. Saint Gertrude Place Santa Ana, CA 92705

- Available linear spread and softening lenses
- Accepts chromatic and UV stop filters

Lens

- Borosilicate safety glass

Lamp

– 50W max. MR16 Halogen lamp

www.targettiusa.com

Transformer

- Supplied with 120V primary, for 277V consult factory
- Thermal protection that meets UL and NEC requirements

Accessories (1 Max. per fixture)

- Framing projector
- Adjustable barn doors
- UV stop filter
- Chromatic filters in red, green, blue, yellow and magenta
- Consult factory for multiple accessories

Labels – UL listed



ph 714.957.4950 **fx** 714.957.4955

Copyright © 2006 TNA 6.06 PRO/TRK 5 V1



Ordering Information

Fixture					Accessories		
TRIM	CAT. #	MOUNT	LAMP	COLOR*	DESCRIPTION	COLOR	CAT. #
MR16 Projector	US1T0687D1	Wall/Ceiling	50W MR16	White	Framing Projector	Aluminum	US1T0742
	US1T1376D1			Black	Adjustable Barn Doors	Black	US1T0741
	US1T0686D1	_		Aluminum	Chromatic Dichroic Filters – Ø 1.38"	Red	US49891
	US1T0691D1	Two Circuit		White	for use with Framing Projector	Green	US49892
-	US1T1377D1	– Track –		Black Aluminum		Blue	US49896
	US1T0690D1					Yellow	US49897
						Magenta	US49898
					Chromatic Dichroic Filters –	Red	US49881
	a				Ø 2"	Green	U\$49882
	SA					Blue	US49886
						Yellow	US49887
						Magenta	US49959
					UV Stop Filter	Clear	U\$49880
djustable Barn Doors	Framing Pro	ector	Chromatic / UV Stop Filters		Corrective FIlters	Light Peach	US1T1750
						Medium Peach	US1T1751
						Dark Peach	US1T1752
						Light Pink	US1T1741
						Medium Pink	US1T1742
						Dark Pink	US1T1743
						Light Blue	US1T1744
						Medium Blue	US1T1745
						Dark Blue	US1T1746
						Light Yellow	US1T1747
						Medium Yellow	US1T1748
						Dark Yellow	US1T1749

fx 714.957.4955

1513 E. Saint Gertrude Place

TARGETTI a division of TARGETTI NORTH AMERICA 1513 E. Saint Gertrude Santa Ana, CA 92705

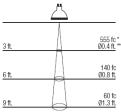
www.targettiusa.com

Foho Pro MR16 Projector

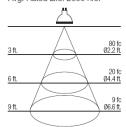
TARGETTI

Photometric Information





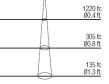
20MR16Q/40°/FL (BAB) CBCP: 700 cd Avg. Rated Life: 2000 hrs.



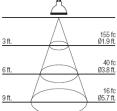
35MR16Q/8°/NSP (FRB) CBCP: 11,000 cd Avg. Rated Life: 3000 hrs. 3 ft.

6 ft.

9 ft.



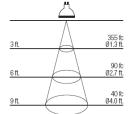
35MR16Q/35°/FL (FMW) CBCP: 1400 cd Avg. Rated Life: 3000 hrs.



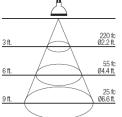
50MR16Q/12°/NSP (EXT) CBCP: 11,000 cd Avg. Rated Life: 3500 hrs. ...

	\bigtriangleup	
3 ft.	A	1220 fc Ø0.6 ft.
6 ft.	A	305 fc Ø1.3 ft.
<u>9 ft.</u>	6	135 fc Ø1.9 ft.

50MR16Q/25°/NFL (EXZ) CBCP: 3200 cd Avg. Rated Life: 3500 hrs.



50MR16Q/40°/FL (EXN) CBCP: 2000 cd Avg. Rated Life: 3500 hrs.



* fc= footcandles ** diameter in feet CBCP= center beam candle power cd= candella

TARGETTI a division of www.targettiusa.com

TARGETTI 1513 E. Saint Gertrude NORTH AMERICA Santa Ana, CA 92705

1513 E. Saint Gertrude Place

ph 714.957.4950 fx 714.957.4955

Copyright © 2006 TNA 6.06 PRO/TRK 5 V1



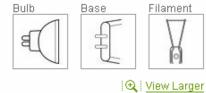
Lamp A3

20843 - Q71MR16/C/NSP15 GE MR16

GENERAL CHARACTERISTICS

Lamp type	Halogen - MR
Bulb	MR16
Base	2-Pin (GX5.3)
Filament	C-6
Wattage	71
Voltage	12
Voltage (MIN)	71
Rated Life	4000 hrs
Rated Life (Vert)	4000 hrs
Lamp Enclosure Type (LET)	Open or enclosed fixtures





PHOTOMETRIC CHARACTERISTICS

Initial Lumens	11500
Initial Lumens (Hor)	11500
Initial Lumens (Vert)	11500
Center Beam Candlepower (CBCP)	11500
Color Temperature	3050 K
Nominal Initial Lumens per Watt	161

DIMENSIONS

Maximum Overall Length (MOL)	1.8750 in (47.6 mm)
Bulb Diameter (DIA)	2.000 in (50.8 mm)

PRODUCT INFORMATION

Product Code	20843
Description	Q71MR16/C/NSP15
ANSI Code	EYF
Standard Package	BUNDLE
Standard Package GTIN	30043168208438
Standard Package Quantity	20
Sales Unit	Unit
No Of Items Per Sales Unit	1
No Of Items Per Standard Package	20
UPC	043168208437

ADDITIONAL RESOURCES

Cat	alogs
Tes	timonials
Bro	chures
P	roduct Brochures
•	Color
A	oplication/Segment Brochures
	Contractor Lighting
Sell	Sheets
• 0	€ ConstantColor® Precise™ MR16 Lamps
IES/	Photometric Download
MS	OS (Material Safety Data Sheets)
Disi	oosal Policies & Recycling Information

Fixture Type A4

Type:

Order Number:

The miniaturized 260 series spotlight is integrated to a low profile, fitting extension that houses an electronic transformer. The hinged front is easily opened for relamping and inserting any double combination of the entire range of LSI AAA accessories. This fixture also incorporates a rotatable/lockable front for proper positioning of asymetrical distribution lenses. A special feature of this series is the removable front hinge assembly, which makes changing the entire front possible without tools, allowing the fixture to be transformed from a spotlight to a wallwash in seconds.

The 260 unit will accommodate all the energy efficient Tungsten Halogen MR16 lamps from 20 to 75 watts, in a wide variety of beam spreads.

These lamps give excellent color rendition and produce a more efficient, whiter brighter light than standard incandescent lamps, with longer life and less heat emission. This unit features no spill light or glare from the lamp through any part of the housing assembly, and it has a removable Cross Baffle as part of the fixture front which eliminates frontal spill light and glare.

260 Series 12V MR16

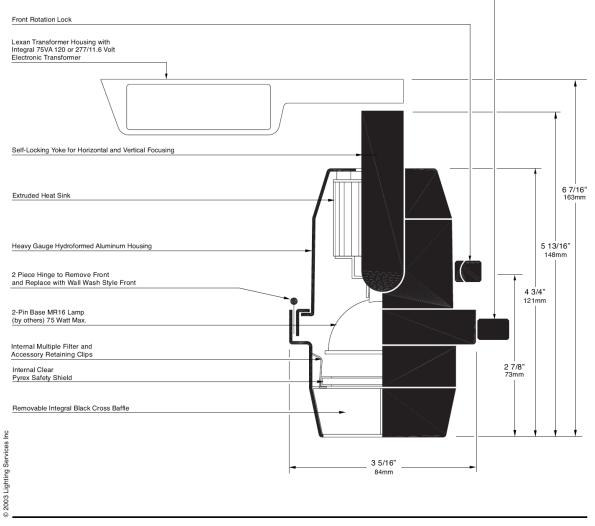
Units are self-locking in all horizontal and vertical planes and are available in standard LSI Black, White, Silver, Graphite, and Platinum finishes.

UL and CUL Listed / CE Certified USA Manufactured /IBEW

260-00 (120V) V260-00 (277V)

Relamping Handle

Job Name:



Lighting Services Inc 2 Kay Fries Drive, Stony Point NY 10980-1996 / +1 845 942-2800 Fax +1 845 942-2177 / www.LightingServicesInc.com CM373 1-07

Job Name:

Type:

 15°

40°

2200

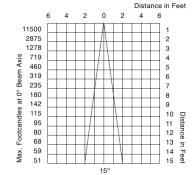
Order Number:

260 Series 12V MR16

Photometric Data⁵

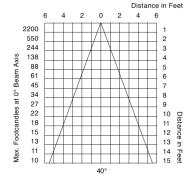
Q71MR16/C/NSP15° 71 watt/12 volt Narrow Spot/3050K Beam Spread to 50% of CBCP

Center Beam Candlepower 11500



Q71MR16/C/FL40° 71 watt/12 volt Flood/3050K Beam Spread to 50% of CBCF

Center Beam Candlepower



Lamp Types

Q20MR16/C/VNSP7° 20 watt/12 volt 3000 hours Beam Spreads to 50% of CBCP Center Beam Candlepower 7400 Color Temperature 2900K

Q20MR16/C/NSP15° 20 watt/12 volt 5000 hours Beam Spread to 50% of CBCP 15° Center Beam Candlepower 3750 Color Temperature 2900K

Q20MR16/C/FL40° 20 watt/12 volt 5000 hours Beam Spread to 50% of CBCP 40° Center Beam Candlepower 525 Color Temperature 2900K

Q35MR16/C/SP20° 35 watt/12 volt 5000 hours Beam Spread to 50% of CBCP 20 Center Beam Candlepower 3900 Color Temperature 3000K

Q35MR16/C/NFL40° 35 watt/12 volt 5000 hours Beam Spread to 50% of CBCP 40 Center Beam Candlepower 1000 Color Temperature 3000K

12300

3000K

Q42MR16/C/VNSP9° 42 watt/12 volt 3500 hours Beam Spread to 50% of CBCP Center Beam Candlepower Color Temperature

Lighting Services Inc

Q50MR16/C/NSP15° 50 watt/12 volt 6000 hours Beam Spread to 50% of CBCP 15 Center Beam Candlepower 9100 Color Temperature 3050K

Q50MR16/C/NFL25° 50 watt/12 volt 6000 hours Beam Spread to 50% of CBCP 25 Center Beam Candlepower 3200 Color Temperature 3050K

Q50MR16/C/NFL30° 50 watt/12 volt 6000 hours Beam Spread to 50% of CBCP 30 Center Beam Candlepower 2500 Color Temperature 3050K

Q50MR16/C/FL40° 50 watt/12 volt 6000 hours Beam Spread to 50% of CBCP 40 1700 Center Beam Candlepower Color Temperature 3050K

Q50MR16/C/WFL55° 50 watt/12 volt 6000 hours Beam Spread to 50% of CBCP 55 Center Beam Candlepower 900 3050K Color Temperature

Q71MR16/C/NSP15° 71 watt/12 volt 4000 hours Beam Spread to 50% of CBCP Center Beam Candlepower 15 11500 Color Temperature 3050K

Q71MR16/C/NFL25° 71 watt/12 volt 4000 hours Beam Spread to 50% of CBCP 25 Center Beam Candlepower 5500 Color Temperature 3050K

Q71MR16/C/FL40° 71 watt/12 volt 4000 hours Beam Spread to 50% of CBCP 40 Center Beam Candlepower 2200 Color Temperature 3050K

Accessories

261FR

Entire wall wash style front assembly including slash front, internal accessory clips, AAA995 spread lens and kicker-reflector, specify color.

Louver Hex AAA

Hexcell metal louver, controls spill light and glare, 45° cutoff, black finish.

Glass Color Filters, Size AAA Selection of 95 permanent rimmed dichroic and rimmed and slotted standard colors.

Spread Lens AAA992

ermanent molded glass lens for spreading light beam in one axis-nominal 5°X 30°.

Spread Lens AAA995

Permanent molded glass lens for spreading light beam in all directions—nominal 50° X 50°.

Spread Lens AAA996

Permanent molded glass lens for spreading light beam slightly more in one direction than the other-nominal 45° X 50°

Beam Softener AAA998

Permanent glass lens for conditioning light to create a softer beam.

OPTIVEX[™] UV Blocking Filter AAA962 Eliminates ultra-violet wavelengths below

410±10nm. Especially useful for conservation of artworks and to help prevent fading.

Light Blocking Screens, Size AAA

AAA801-20% Light Blocking, AAA802-30% Light Blocking, AAA803-40% Light Blocking Stainless Steel Screens. Used individually or in combination to reduce transmitted light without changing its color temperature.

Ordering Information Model Number

add prefix V for 277 Volt add suffix letters for finish

260-007

Lexan Fitting for and 2 circuit LSI Track With switch.

260-5E

Canopy for permanent mounting on standard 4' octagonal outlet boxes. With transformer.



Wrench Locking For permanent locking of fixture position, add "WL" to model number.

Finishes	(Paint)
Black	(suffix B)
White	(suffix W)
Silver	(suffix S)
Graphite	(suffix G)
Platinum	(suffix P)

1. CBCP = Center Beam Candlepowe

- CBOP = Center beam Candidpower
 K = Color Temperature in Kelvin degrees
 /C/ = Constant Color
 OPTIVEX= glass is a trademark of Bausch & Lomb Inc.
 LTL Test # 07121, 07123
 Lamp Manufacturers Published Data
 Not for use with Unimount or Emergency/Worklite track

2 Kay Fries Drive, Stony Point NY 10980-1996 / +1 845 942-2800 Fax +1 845 942-2177 / www.LightingServicesInc.com CM373 1-07

Lamp A4

20833 - Q50MR16/C/FL40 GE ConstantColor® Precise™ MR16

PHOTOMETRIC CHARACTERISTICS

Center Beam Candlepower 1700

Nominal Initial Lumens per 34

Initial Lumens

(CBCP)

Watt

(MOL)

DIMENSIONS

Initial Lumens (Hor)

Initial Lumens (Vert)

Color Temperature

GENERAL CHARACTERISTICS

	-
Lamp type	Halogen - MR
Bulb	MR16
Base	2-Pin (GX5.3)
Filament	C-6
Wattage	50
Voltage	12
Voltage (MIN)	50
Rated Life	6000 hrs
Rated Life (Vert)	6000 hrs
Lamp Enclosure Type (LET)	Open or enclosed fixtures

1700

1700

1700

3050 K

1.8750 in (47.6 mm)

2.000 in (50.8 mm)





ADDITIONAL RESOURCES

Catalogs

Testimonials

- Brochures
 - Application/Segment Brochures Beauty Salon Lighting
 - Contractor Lighting

 - <u>Gontactor Lighting</u>
 <u>Healthcare Lighting</u>
 <u>Office Lighting</u>
 <u>Specialty Store Lighting</u>
 Product Brochures

<u>Color</u> <u>XL Brochure</u>

- Sell Sheets
- GE ConstantColor® Precise™ MR16 Lamps

IES/Photometric Download

PRODUCT INFORMATION

Maximum Overall Length

Bulb Diameter (DIA)

Product Code	20833
Description	Q50MR16/C/FL40
ANSI Code	EXN
Standard Package	BUNDLE
Standard Package GTIN	00043168208338
Standard Package Quantity	20
Sales Unit	Unit
No Of Items Per Sales Unit	1
No Of Items Per Standard Package	20
UPC	043168994262

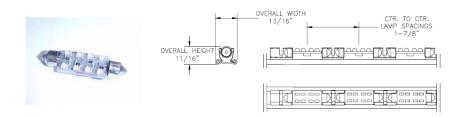
MSDS (Material Safety Data Sheets) **Disposal Policies & Recycling Information**

Fixture Type A5



TYPE:_____ CATALOG NUMBER:_____

CLIKSTRIP: LED ELEMENT LOW VOLTAGE FESTOON STYLED LED LAMP



SECIFICATIONS:

I. Performance:

- For use with Clikstrip and standard profile lamp clips.
- Suitable for Dry locations.
- Easy snap fit in standard festoon lamp spaces.
- Uses Nichia white LED's, total power consumption | Watt.
- Light output: 8 lumens (warm white), 10 lumens (cool white)
- 50,000 hour lamp life
- Other color LED's available, consult factory.
- 2. Lamp Types:
 - Voltages available 1 2VAC and 24 VAC.
- 3. Color Temperature:
 - Warm White: 2900K
 - Cool White: 5000K

Ordering Information:

Catalog Numbers:

WW2A - Warm White LED's 12 VAC CW2A - Cool White LED's 12 VAC WW4A - Warm White LED's 24 VAC CW4A - Cool White LED's 24 VAC

ARDEE LIGHTING INC.

A Subsidiary of JJI Lighting Group, Inc. PO Box 1769, 639 Washburn Switch Rd. Shelby, NC 28151 (704) 482-2811; Fax (800) 275-1544 www.ardeelighting.com E-mail: ardee@jjishelby.com

> 022073 2/17/2006



Ordering information

To specify a complete catalog number, choose one item from the selection available in each module.

XXXX XX X

Series

CPPR Parabolic-shaped, specular finished, linear reflector

Nominal length

CPPR 05-15 0.5 - 1.5 meters in half meter increments

CPPR 01-05 1' - 5' in 1' increments

Unit of measure

CPPR	XX	F	Feet
CPPR	XX	М	Meters

PR Serles

A pre-finished, parabolic-inspired, linear aluminum reflector designed to focus light from festoon or looped lamps either up or down.

- · Formed aluminum sheet, pre-finished specular Alzak inside
- · Outer surface can be painted upon request
- · Available in lengths up to 5 feet
- · Easily field cut or can be supplied in any specified length
- · Use with all Clikstrip series strips, order separately
- · UL/C listed for use with festoon or looped lamps up to 10 watts





HIGH PROFILE CLIKSTRIP

LOW PROFILE CLIKSTRIP

NOTE:

combine PR reflector with other Clikstrip extrusions to provide smooth accent light with festoon lamps.

Fixture Type A6

COLORBLAST 12





Color Kinetics[®] ColorBlast[®] 12 is a Chromacore[®] powered product designed for washing walls with rich, saturated colors and color changing effects. ColorBlast 12 is specifically designed with the needs of lighting designers, architects, and retail window directors in mind. A fully sealed product, ColorBlast 12 is designed for both indoor and outdoor installations. The stylish and rugged die-cast aluminum housing meets or exceeds specifications for use in wet and damp locations. ColorBlast 12 is available with a soft-focus tempered glass lens, or a clear tempered glass lens. The soft-focus lens produces a soft-dge 23° beam of light, while the clear lens offers a 10° beam angle for extended light projection. The housing is also equipped to affix spread lenses, lowers, and other attachments. light projection. The housing is also equipped to affix spread lenses, lowers, and other attachments and is available in either black or white finish. A single 3-wire, 60-foot (18.3 m) power cable, rated for outdoor installations, provides both power and data to the light fixture.

Designed to quickly aim the fixture without the need of special tools, ColorBlast 12 features a locking, industrial-grade constant torque hinge. Set screws and an Allen wrench are included for installations requiring locked positioning. Installation is simple – a pre-assembled mounting base allows for after-installation rotation – eliminating the need for precise junction box positioning. The locking base is positioned easily with a smooth, friction-free rotation of up to 350° of travel. The 110° hinge rotation expands the range of light positioning available. A water-tight seal ensures IP rating and maximum longevity.

ColorBlast 12 can be controlled by a Color Kinetics controller or a third-party controller. Each fixture comes pre-addressed to light number one. Simple effects such as fixed color and color wash, require no additional addressing. Other effects across multiple lights, including Chasing Rainbow or Color Sweep, require further addressing using one of the following Color Kinetics addressing tools: Serial Addressing Software (SAS) or Zapi. For protection from extreme temperatures, ColorBlast 12 has been designed with a temperature monitoring feature. If operating temperatures rise to an unsafe level, a compensation circuit is triggered and ColorBlast 12 operation is interrupted causing the lights to turn dull red. After 30 minutes the lights will auto-cycle and return to full intensity.

COLORBLAST SPECIFICATIONS

	COLORDERST STEERING								
	COLOR RANGE	16.7 million (24-bit) additive RGB colors; continuously variable intensity							
	SOURCE	36 High intensity RGB LEDs							
	BEAM ANGLE	23° ground lens, 10° clear lens							
	HOUSING	Die Cast Aluminum in black or white finish							
KINETICS	LENSES	Soft-focus tempered glass or clear tempered glass							
	CONNECTORS	60-foot (18.3 m) Unified power and data cable							
BIN [™]	LISTINGS	UL/C-UL listed, CE							
	COMMUNICATION SP	ECIFICATIONS							
	DATA INTERFACE	Color Kinetics data interface system							
	CONTROL	Color Kinetics full line of controllers including Light System Manager or other							
		DMX512 (RS485) sources							
	ELECTRICAL SPECIFICA	TIONS							
	POWER REQUIREMENT	24VDC							
\bigcirc									
: UUus	POWER CONSUMPTION	50W Max. at full intensity (full RGB)							
LISTED	POWER SUPPLY	PDS-150e (ITEM# 109-000008-01); PDS-60 24V (ITEM# 109-000017-XX)							
78GF	ENVIRONMENTAL SPECIFICATIONS								
e, Frosted Lens)	TEMPERATURE RANGE	-40°F to 122°F (-40°C to 50°C) operating temperature							
, Frosted Lens) e, Clear Lens)		-4°F to 122°F (-20°C to 50°C) starting temperature							
t, Clear Lens)	PROTECTION RATING	IP66							
lowing patents: U.S. ther patents listed at her patents pending.	LED SOURCE LIFE								
All rights reserved. the Color Kinetics orCast, ColorPlay, , iPlayer, Optibin,	In traditional lamp sources, lifetime is defined as the point at which 50% of the lamps fail. This is also termed Mean Time Between Failure [MTBF]. LEDs are semiconductor devices and have a much longer MTBF than conventional sources. A However, MTBF is not the only consideration in determining useful life. Color Kinetics uses the concept of useful light output								

Video Video

Temperature and effects will affect lifetime. Color Kinetics rates product lifetime using lumen depreciation to 50% of original light output. When the fixture is running at room temperature using a color wash effect, the range of lifetime is in the range of 80,000-100,000 hours. This is IED manufacturers' test data. High output is defined as any IED device that is 1/2 watt or above. For more detailed information on source life, please see www.colorkinetics.com/lifetime.



OPTI BY COLOR K DRY DAMP

CHROMA



116-000012-00 (White 116-000012-01 (Black, 116-000012-02 (White 116-000012-03 (Black,

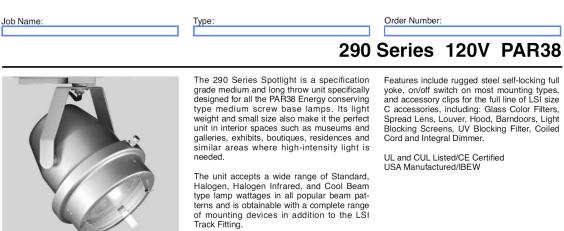
oduct is protected by one or more of the follo Patent Nos. 6,016,038, 6,150,774 and oth http://colorkinetics.com/patents/. Othe

©20052006 Color Kinetics Incorporated. All right reserved. Chromacore, Chromasic, Color Kinetics, the Color Kinetics Ogo, ColorBatt, ColorBart, ColorCa, ColorPlay, ColorScope, Direct Ught, Color, IColor Cove, IPbyer, Optibin Powercore, Quickfay, Sueze, the Source logo, and Smartjuice are registered trademarks and DiMand, Insili/White, Video With Ught and Ught Without Limits are trademarks of Color Kinetics Incorporated

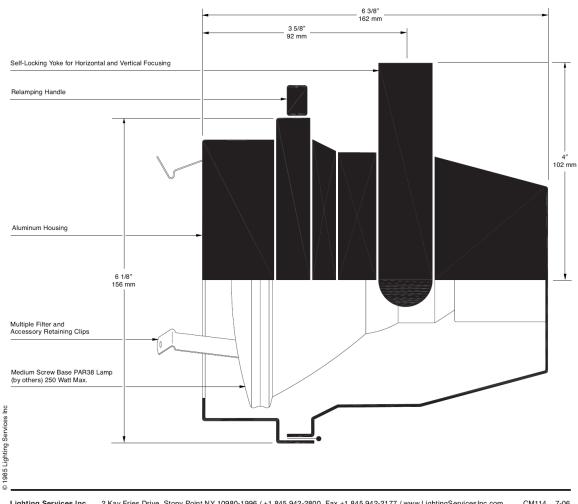
All other brand or product names are trademarks registered trademarks of their respective owners.

Specifications subject to change without notice. Refer to colorkinetics.com for the most recent data sheet versions.

Fixture Type A7



290-00



Lighting Services Inc 2 Kay Fries Drive, Stony Point NY 10980-1996 / +1 845 942-2800 Fax +1 845 942-2177 / www.LightingServicesInc.com CM114 7-06

Job Name:

Type

Order Number:

290 Series 120V PAR38

Photometric Data⁷

16 14

FL SP 29000 6300

7250 1575

3222 700

1813 394

1160 252

806 175

592 129

453 98

358 78

63

52 E 201

44

19

.<u>s</u> 290 ¥ 240

172 37

113 25

80 17

73 16

00 Footcan 22

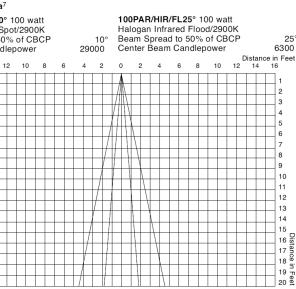
Max.

e e

ò 148 32

ы 3 129 28

100PAR/HIR/SP10° 100 watt Halogen Infrared Spot/2900K Beam Spread to 50% of CBCP Center Beam Candlepower



Ordering Information Model Number add suffix letters for finish

290-00

Lexan Fitting for 1 and 2 circuit LSI Track. With switch 290-00F Same as above, with fuse.

290-2G

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





290-3G

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



Lamp Types

60PAR/HIR/SP10° 60 watt, 3000 hours CBCP 20000 / Color Temperature 2875K

60PAR/HIR/FL30° 60 watt, 3000 hours CBCP 3600 / Color Temperature 2875K

60PAR/HIR/FL40° 60 watt, 3000 hours CBCP 2000 / Color Temperature 2875K

80PAR/HIR/SP10° 80 watt, 3000 hours CBCP 25000 / Color Temperature 2900K

80PAR/HIR/FL25° 80 watt, 3000 hours CBCP 5500 / Color Temperature 2900K

90PAR/H/SP10° 90 watt, 2500 hours CBCP 16000 / Color Temperature 2870K

90PAR/HIR/SP12°/XL 90 watt, 6000 hours CBCP 12000 / Color Temperature 2800K

90PAR/H/FL25° 90 watt, 2500 hours CBCP 4100 / Color Temperature 2870K

90PAR/H/CB/FL25° 90 watt, 2500 hours CBCP 4100 / Color Temperature 2870K

90PAR/HIR/FL40°/XL 90 watt, 6000 hours CBCP 2800 / Color Temperature 2800K

100PAR/HIR/SP10° 100 watt, 3000 hours CBCP 29000 / Color Temperature 2900K

100PAR/HIR/FL25° 100 watt, 3000 hours CBCP 6300 / Color Temperature 2900K

100PAR/HIR/FL40° 100 watt, 3000 hours CBCP 3400 / Color Temperature 2900K

Q250PAR/SP10° 250 watt, 4200 hours CBCP 40000 / Color Temperature 2880K

Q250PAR/FL30° 250 watt, 4200 hours CBCP 9000 / Color Temperature 2880K

Accessories

Louver C

1/2" cellular metal louver, controls spill light and glare, 45° cutoff.

10° X 25 Hood C

3" deep cylindrical hood controls spill light and glare, black interior.

Hood Sparkle C

3" deep cylindrical hood controls spill light and glare, with decorative sparkle effect. Cross Baffle C

2 1/8" deep cylindrical cross baffle hood, controls spill light and glare, black interior. Delta Baffle C

2 1/8" deep cylindrical delta baffle hood, controls spill light and glare, black interior. Barndoor C

4-way individually adjustable blades for control of light beam.

Glass Color Filters, Size C

Selection of 95 permanent rimmed dichroic and rimmed and slotted standard colors. Spread Lens C990

Permanent glass for spreading light beam in one axis, $5^{\circ} \times 50^{\circ}$.

Spread Lens C992

Permanent molded glass lens for spreading light beam in one axis-nominal 5°X 30°.

Spread Lens C995

Permanent molded glass lens for spreading light beam in all directions—nominal 50° X 50°. Spread Lens C996

Permanent molded glass lens for spreading light beam slightly more in one direction than the other-nominal 45° X 50°.

Beam Softener C998 Permanent glass lens for conditioning light

to create a softer beam. OPTIVEX[™] UV Blocking Filter C962

Eliminates ultra-violet wavelengths below 410±10nm. Especially useful for conserva-tion of artworks and to help prevent fading.

Wrench Locking For permanent locking of fixture position, add "WL" to model number.

otes: CBCP = Center Beam Candlepower K = Color Temperature in Kelvin degrees H = Halogen HIR = Halogen Infrared CB = Cool Beam OPTIVEX^m glass is a trademark of Bausch & Lomb Inc. Lamp Manufacturers Published Data on-UL and Non-CUL

2 Kay Fries Drive, Stony Point NY 10980-1996 / +1 845 942-2800 Fax +1 845 942-2177 / www.LightingServicesInc.com Lighting Services Inc CM114 7-06

Cushioned weighted base for floor or table use. With

grounding cord

on standard 4

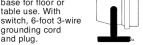
octagonal outlet

Canopy for permanent mounting

and plug.

290-5

boxes.





Light Blocking Screens, Size C C801S-20% Light Blocking, C802S-30% Light Blocking, C803S-40% Light Blocking Stainless Steel Screens. Used individually or in combination to reduce transmitted light without changing its color temperature.

Coiled Cord

18/3 105°C, 18" retracted, 6 foot extended. Specify by adding suffix CC to model number. White fixture supplied with white cord, all other finishes supplied with black cord.

Integral Dimmer

For Yoke Mounted Dimmer add Suffix "FD" to model number.

Finishes	(Paint)
Black	(suffix B)
White	(suffix W)
Silver	(suffix S)
Granhite	(suffix G)

Platinum (suffix P)



* 290-4G

Lamp A7



Product Number: 14311

Order Abbreviation: 100PAR38/CAP/IR/FL40 120V

General Description: Tungsten Halogen CAPSYLITE IR PAR38 Reflector Lamp Medium Skirt Base 100Watt 120Volt Flood Beam

	Product Information
Abbrev. With Packaging Info.	100PAR38CAPIRFL40 120V 12/CS 1/SKU
Approx. Lumens	2070
Average Rated Life (hr)	3000
Base	E26 Medium Skirted
Beam Angle (deg)	40
Beam Type	FL
Bulb	PAR38
Centerbeam Candlepower (cp)	3400
Class	C (gas)
Color Rendering Index (CRI)	100
Color Temperature/CCT (K)	2900
Diameter (in)	4.75
Diameter (mm)	120.65
Ecologic	NO
Family Brand Name	CAPSYLITE® IR® PAR38
Filament	CC-8
Horizontal Beam Angle (deg)	40
Maximum Overall Length - MOL (in)	5.313
Maximum Overall Length - MOL (mm)	134.9375
Nominal Voltage (V)	120.00
Nominal Wattage (W)	100.00
Vertical Beam Angle (deg)	40

Fixture Type A8

Type:

Job Name:

Preliminary Spec Sheet



The LumeLEX[™] Series is an exciting new line of fixtures featuring the Lexel[™] technology, a universal platform for solid state lighting (SSL). The LumeLEX[™] combines breakthroughs in thermal design, optics and feedback to provide precise color temperature control and dimming. The LumeLEX[™] uses significantly less energy to produce the same amount of light as a conventional light source.

The decidedly contemporary design of the LumeLEX[™] Series makes it perfect for interior spaces such as high end retail, museum and gallery installations, where useful, quality white light is critical.

Order Number:

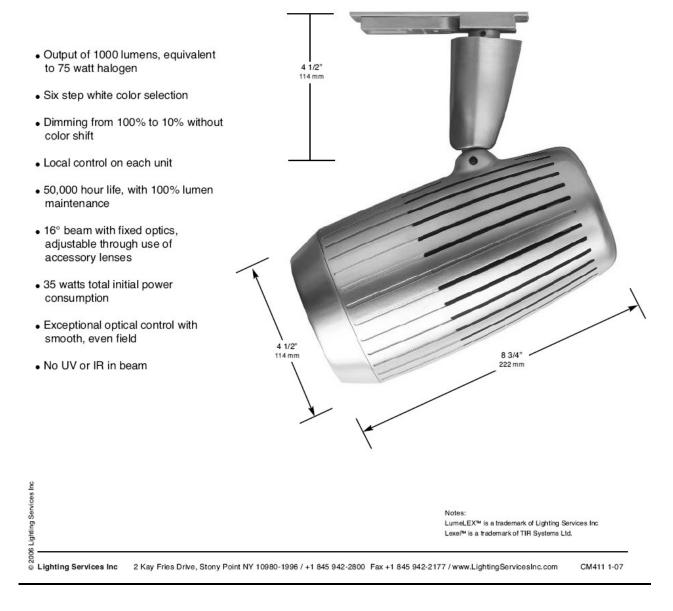
LumeLEX[™] Series

Due to significant advances in thermal management and feedback control, the LumeLEX™ has a life of 50,000 hours. The unit comes equipped with six preset color temperature options: 2700°K, 3000°K, 3500°K, 4000°K, 5000°K and 6500°K, and an on-board dimmer capable of changing output from 100% to 10% without color shift.

All units are adjustable and self-locking in all horizontal and vertical planes and are available with all LSI mounting fittings, in standard LSI Black, White, Silver, Graphite, and Platinum finishes, and a variety of optical accessories.

UL and CUL Listed USA Manufactured /IBEW

LumeLEX™



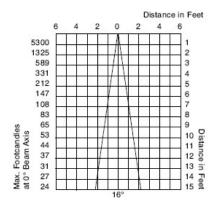
Job Name:

LumeLEX[™] Series

Photometric Data

System Specs

LumeLEX 35watt, 50000 hrs Color Temperature 2700K-6500K, 6 steps Lumens 1000 Beam Spread (Minimum) 16° Center Beam Candlepower 5300



Accessories

Type:

Spread Lens C990

Permanent glass for spreading light beam in one axis, 5° X 50°.

Spread Lens C992

Permanent molded glass lens for spreading light beam in one axis-nominal 5°X 30°.

Spread Lens C995

Permanent molded glass lens for spreading light beam in all directions-nominal 50° X 50°.

Spread Lens C996

Permanent molded glass lens for spreading light beam slightly more in one direction than the other-nominal 45° X 50°.

Louver Hex LX

Hexcell metal louver, controls spill light and glare, 45° cutoff, black finish.

Hood LX

Cylindrical hood, controls spill light and glare, 45° cutoff, black interior.

Preliminary Spec Sheet

Ordering Information Model Number

LX1000-00

for 1 and 2 circuit LSI Track.

With switch.

Lexan Fitting

Order Number:

4 1/2"

LX1000-2G Universal fitting for Unistrut Systems and any screw or bolt-up applications. With switch, 6-foot 3-wire grounding cord and plug.



LX1000-3G C-clamp for pipes from 5/8" to 2" O.D. With switch. 6-foot 3-wire grounding cord and plug.



Configuration

All units come with on-board CCT selection for 6 pre-set color temperatures and dimmer for 100% to 10% output.



LX1000-5A Canopy for permanent mounting on standard 4" octagonal outlet boxes.



Finishes (Paint) Black (suffix B) (suffix W) White Silver (suffix S) Graphite (suffix G) Platinum (suffix P)

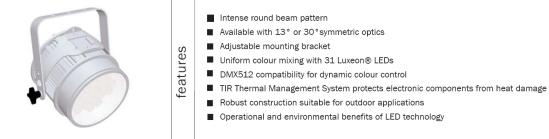
Notes:

1. K = Color Temperature in Kelvin degrees LumeLEX[™] is a trademark of Lighting Services Inc
 Lexel[™] is a trademark of TIR Systems Ltd.

Fixture Type EX1

DESTINY[™] Destiny SP





S	OPTICS	13° or 30° symmetric spot optics
ations	LIGHT SOURCE	31 Luxeon® high flux LEDs
ecificat	DISTRIBUTION	Symmetric round beam projection
rd spe	SETBACK DISTANCE	4 feet to 30 feet
standard	FINISH	Two standard powdercoat finishes: silver or black
st	POWER SUPPLY	100V - 240V auto ranging (90W capable of powering two Destiny SP units) NEMA type 4 enclosure (Hammond 1414N4PHK)

	DES —	SP —				- DMX
	SERIES	PRODUCT	OPTIC	LED LIGHT COLOUR	FINISH	NETWORK
standard order codes	Destiny™	Destiny SP	13 13° beam angle 30 30° beam angle	RGB 7 red, 12 green, 12 blue RED 31 red GRN 31 green BLU 31 blue ABR 31 amber CWH 31 cool white, 5600K	BLK Black SLR Silver WHT White	DMX



 TIR Systems Ltd.
 1 800 663 2036

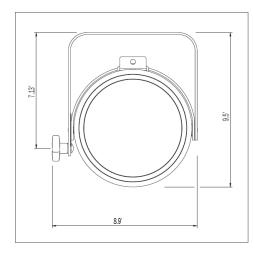
 7700 Riverfront Gate
 T 604 294 8477

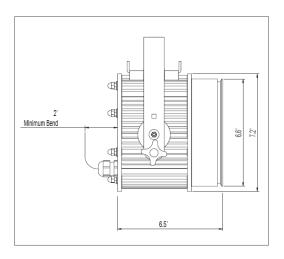
 Burnaby BC
 F 604 294 3733

 Canada V5J 5M4
 www.tirsys.com

 Destiry SP_Version 1_Imp_07 July 2005 Page 1

	ical	HOUSING	Extruded aluminum		
	mechanical	MOUNTING		rs mounting with standard stable locking mechanism	C-clamp or surface mounting
S		MAXIMUM INPUT POWER	MODEL	OUTPUT COLOUR (ON FULL)	LUMINAIRE INPUT POWER
technical specifications	rical		RGB RGB RGB RGB Single color option	Red Green Blue White Red, Green, Blue Amber, White	8 W 13.5 W 13.5 W 35 W 35 W
technical s	electrical	CONNECTIONS	Power (Iuminaire): +	standard 110/220/240	nd output DMX
		TEMPERATURE RANGE	-40°F to 104°F op -4°F to 104°F start	- ·	
	Ital	CERTIFICATION	CUL / UL / CE		
	environmental	INGRESS PROTECTION	IP66		







 TIR Systems Ltd.
 1 800 663 2036

 7700 Riverfront Gate
 T 604 294 8477

 Burnaby BC
 F 604 294 3733

 Canada V51 5M4
 www.ttrsys.com

 Destiny SP_Version 1_Imp_07 July 2005 Page 2

Throw			Vertical Illuminance (fc)											
Dista	nce (1	feet)	8'	SETBAC	ж			20' SETBACK						
4.0	0.2	0.4	0.5	0.6	0.5	0.4	0.2	1.1	1.5	1.9	2.1	1.9	1.5	1.1
3.0	0.5	0.9	1.5	1.8	1.5	0.9	0.5	1.9	2.8	3.7	4.1	3.7	2.8	1.9
2.0	0.9	2.2	4.7	6.5	4.7	2.2	0.9	2.9	4.8	6.9	7.8	6.9	4.8	2.9
1.0	1.4	4.8	18.7	36.5	18.7	4.8	1.4	3.8	6.9	10.2	11.8	10.2	6.9	3.8
0.0	1.7	7.1	36.4	82.9	36.4	7.1	1.7	4.2	7.8	11.7	13.3	11.7	7.8	4.2
-1.0	1.4	4.8	18.7	36.5	18.7	4.8	1.4	3.8	6.9	10.2	11.8	10.2	6.9	3.8
-2.0	0.9	2.2	4.7	6.5	4.7	2.2	0.9	2.9	4.8	6.9	7.8	6.9	4.8	2.9
-3.0	0.5	0.9	1.5	1.8	1.5	0.9	0.5	1.9	2.8	3.7	4.1	3.7	2.8	1.9
-4.0	0.2	0.4	0.5	0.6	0.5	0.4	0.2	1.1	1.5	1.9	2.1	1.9	1.5	1.1
	-3'	-2'	-1'	0	+1'	+2'	+3'	-3'	-2'	-1'	0	+1'	+2'	+3'

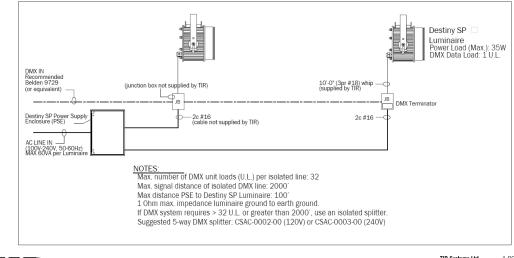
=	Throw	,		Vertical Illuminance (fc)											
	Dista	nce (1	feet)	4'	SETBAC	к			8' SETBACK						
2	4.0	0.3	0.5	0.7	0.7	0.7	0.5	0.3	1.0	1.4	1.8	1.9	1.8	1.4	1.0
	3.0	0.6	1.1	1.8	2.2	1.8	1.1	0.6	1.6	2.5	3.5	3.9	3.5	2.5	1.6
	2.0	1.1	2.5	5.6	7.8	5.6	2.5	1.1	2.5	4.3	6.4	7.5	6.4	4.3	2.5
5	1.0	1.7	5.4	17.2	30.1	17.2	5.4	1.7	3.4	6.4	10.2	12.1	10.2	6.4	3.4
	0.0	2.0	7.4	29.7	57.6	29.7	7.4	2.0	3.8	7.4	12.1	14.4	12.1	7.4	3.8
	-1.0	1.7	5.4	17.2	30.1	17.2	5.4	1.7	3.4	6.4	10.2	12.1	10.2	6.4	3.4
2	-2.0	1.1	2.5	5.6	7.8	5.6	2.5	1.1	2.5	4.3	6.4	7.5	6.4	4.3	2.5
	-3.0	0.6	1.1	1.8	2.2	1.8	1.1	0.6	1.6	2.5	3.5	3.9	3.5	2.5	1.6
	-4.0	0.3	0.5	0.7	0.7	0.7	0.5	0.3	1.0	1.4	1.8	1.9	1.8	1.4	1.0
		-3'	-2'	-1'	0	+1'	+2'	+3'	-3'	-2'	-1'	0	+1'	+2'	+3'

Γ

IR

R

り act to change. For up to date product information, please log on to www.tirsys.com



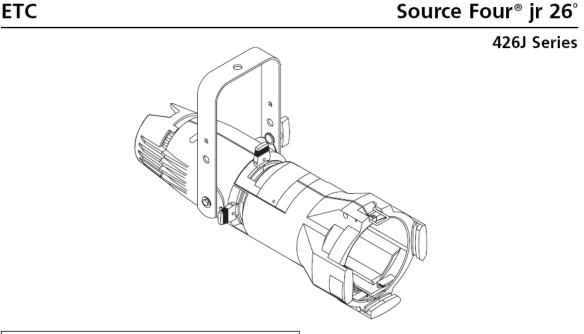
 TIR Systems Ltd.
 1 800 663 2036

 7700 Riverfront Gate
 T 604 294 8477

 Burnaby BC
 F 604 294 3733

 Canada V5J 5MA
 www.tirsys.com

 Destiny SP_Version 1_Imp_07 July 2005 Page 3



SPECIFICATIONS

Ellipsoidal lighting fixture

PHYSICAL Die cast aluminum construction

20 gauge stainless steel shutters in a bi-plane assembly Interchangeable lens tubes with smooth–running teflon guides provide six user-fit field angle options High impact, thermally insulated knobs and shutter handles

Two accessory slots, and a top mounted, gel frame retainer

Steel yoke with two mounting positions

Positive locking, hand-operated yoke clutch

Slot for stainless steel patterns

Slot with sliding cover for motorized pattern devices or optional iris

UL and cUL listed

ELECTRICAL115-240V, 50/60Hz

High temperature 3–conductor 36" leads in a glass fiber outer sleeve Supports ETC Dimmer Doubling™ technology

LAMP HPL – compact tungsten filament contained in a krypton-filled quartz envelope (see table for suitable lamp types) 575W Maximum

OPTICAL Precision molded borosilicate ellipsoidal reflector with aspheric lens and multi-layer dichroic coating Interchangeable lens mount assemblies allow userinstallation of different lens types

Reflector secured with anti-vibration shock mounts Lens(es) secured with anti-vibration shock mounts 95% of visible light reflected through the optical train 90% of infrared radiation (heat) passes through the reflector

Tool free lamp centering (X/Y) and peak/flat (Z) adjustment knobs

Positive locking X, Y and Z adjustments, unaffected by relamping

Interchangeable lens assembly kits permit selection of 26°, 36°, and 50° field angles, and 25°-50° zoom range

ORDERING INFORMATION

Source Four jr

Model#	Description
426J	26° Source Four jr (black)
426J-1	26° Source Four jr (white)
ETC Source	Four jr are supplied with C-clamp, color frame

and 3' (96cm) leads as standard

Connector Designation

Use Suffixes below to specify Factory–Fitted Connector type

Model#	Description
A	Parallel-blade U-ground connector
В	Two-pin and ground, 20 amp connector
С	Grounded, 20 amp, twistlock connector
м	Dimmer Doubling™ Connector (NEMA L515P)

Source Four jr Accessories

Model#	Description
426JL	Source Four jr 26° lens assembly
400SC	Safety cable
400CC	C–clamp (included)
400JRS	Drop–in iris
400CF	Colorframe (6.25") (included)
400DN	Donut (6.25")
400TH	Top hat
400HH	Half hat
400GE	Gel Extender
400PH-M	Pattern holder (M size)

Note: For colors other than black and white, please call ETC.

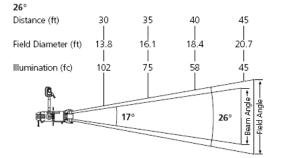


Source Four® jr 26°

426J Series

PHOTOMETRIC

All photometric data in this document was prepared using standard production fixtures, and the PrometricTM CCD measurement system. Fixtures were adjusted for cosine distribution, and were tested with a calibrated HPL 575/115V 16,520 lumens lamp at its rated voltage. All data were normalized to nominal lamp lumens.



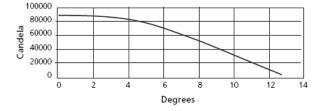
For illumination with any lamp, multiply the candlepower of a beam spread by the multiplying factor (mf) shown for that lamp.

To determine illumination in footcandles or lux at any throw distance, divide candlepower by distance squared.

For Field diameter at any distance, multiply distance by .46

For Beam diameter at any distance, multiply distance by .30

Metric Conversions: For Meters multiply feet by .3048 For Lux multiply footcandles by 10.76



Candlepower Distribution Curve Cosine

Source Four jr 26° (cosine)

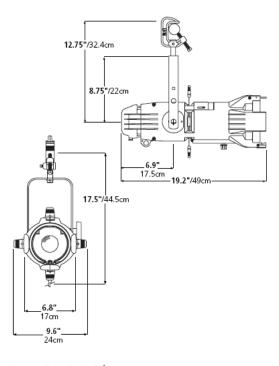
Degree	Candlepower	Field Lumens	Efficacy	Efficiency
26°	92,000	7,312	12.7 LPW	44.3%

PHYSICAL

			Initial	Color	Average	
Lamp code	Watts	Volts	Lumens	Temp.	Rated Life	MF
HPL 575/115	575	115	16,520	3,250°	300	1.00
HPL 575/115X	575	115	12,360	3,050°	2000	0.76
HPL 575/120	575	120	16,460	3,250°	300	1.00
HPL 375/115	375	115	10,540	3,250°	300	0.63
HPL 375/115X	375	115	8,060	3,050°	1000	0.49
HPL 550/77*	550	77	16,170	3,250°	300	1.00
HPL 550/77X*	550	77	12,160	3,050°	2000	0.76
HPL 575/230	575	230	14,900	3,200°	300	0.87
HPL 575/240	575	240	14,900	3,200°	300	0.87
HPL 575/230X	575	230	11,780	3,050°	1500	0.70
HPL 575/240X	575	240	11,780	3,050°	1500	0.74
HPL 375/230X	375	230	7,800	3,050°	1000	0.47
HPL 375/240X	375	240	7,800	3,050°	1000	0.47

*77V lamps are intended for use with the ETC Dimmer Doubler™.

Warning: Use of lamps other than HPL will void UL/cUL safety approval and product warranty. Source Four jr is rated for 575W maximum.



Source Four jr Weights

Model	Fixture Weight*		Shipping	Weight
	lbs	kgs	lbs	kgs
26°	10	4.5	16.5	7.5
* Add 2.3 lbs for (C-clamp			



Corporate Headquarters = 3031 Pleasant View Rd, PO Box 620979, Middleton WI 53562 0979 USA = Tel +1 608 831 4116 = Fax +1 608 836 1736 London, UK = Unit 26-28, Victoria Industrial Estate, Victoria Road, London W3 6UU, UK = Tel +44 (0)20 8896 1000 = Fax +44 (0)20 8896 2000 Rome, T = Via Ennio Quirino Visconti, 11, 00193 Rome, Italy = Tel +39 (06) 32 111 683 = Fax +39 (06) 32 656 90 Holzkirchen, DE = Ohmstrasse 3, 83607 Holzkirchen, Germany = Tel +49 (80 24) 47 00-0 = Fax +49 (80 24) 47 00-3 00 Hong Kong = Room 605-606, Tower III Enterprise Square, 9 Sheung Yuet Road, Kowloon Bay, Kowloon, Hong Kong = Tel +852 2799 1220 = Fax +852 2799 9325 Web = www.etconnect.com = copyrighte 2006 ETC. All Rights Reserved. All product information and specifications subject to change. 70621.007 Rev. D Printed in USA 0706 Source Four[®] products protected by U.S. Patent Number 5,266,613, 5,345,371, 5,54028, 5,4426,537 and 5,775,798. Japanee Fatent Number 2,501,772; US and International Patents Pending.



EDLT

Enhanced Definition Lens Tube — Option for Source Four fixture body. Provides high contrast, crisp gobo projection imaging.



Applicable Product	Catalog #	Part #
Source Four	419EDLT	7060A2046
Source Four	426EDLT	7060A2047
Source Four	436EDLT	7060A2048
Source Four	450EDLT	7060A2049

DROP IN IRIS

Applicable Product	Catalog #	Part #
5°-90° Source Four	400RS	7060A1012
Source Four jr	400JRS	7062A1011



PATTERN HOLDERS



Applicable Product	Dime	nsions	Catalog #	Part #
A size for 5°-90° Source Four	X = 3.25"	Y = 3.75"	400PH-A	7060A1013
B size for 5°-90° Source Four	X = 2.75"	Y = 3.75"	400PH-B	7060A1014
Glass for 5°-90° Source Four	X = 2.75"	Y = 3.75"	400PH-G	7060A1019
M size for Source Four jr	X = 2.12"	Y = 2.75"	400JPH-M	7062A1010

Lamp EX2

Product Number: 54649

Order Abbreviation: HPL 375/115/X (UCF)

General Description: 375 watt, tungsten halogen, HPL series, long life

Product Information				
Abbrev. With Packaging Info.	HPL375115X (UCF)115V 12/CS 1/SKU			
Application	Stage & Studio			
Average Rated Life (hr)	1000			
Base	Medium Bipin with Heat Sink			
Bulb	Т8			
Class	C (gas)			
Color Rendering Index (CRI)	100			
Color Temperature (K)	2950			
Diameter d (in)	0.741			
Diameter d (mm)	19			
Distance a (in)	2.352			
Distance a (mm)	60.3			
Family Brand Name	HPL			
Filament	4-C8			
Lamp Finish	Clear			
Length I (in)	3.822			
Length I (mm)	98			
Length I max. (in)	3.822			
Length I max. (mm)	98			
Light Center Length - LCL (in)	2.352			
Light Center Length - LCL (mm)	60.3			
Luminous Flux (Im)	8000			
Maximum Overall Length - MOL (in)	3.822			
Maximum Overall Length - MOL (mm)	98			
Nominal Voltage (V)	115.00			
Nominal Wattage (W)	375.00			
Operating Position	Any			
Type of Current	AC			



Fixture Type EX2A





ARCADIA 17 Richard Nelson













CRAZED







POP TOP

olmes



FLOATING SQUARES David Davidian



DRY STONE WALL 2

BASKET WEAVE

Kirk Book

SPLINTERS Dennis Parichy



7563 GLASS BRICK

7952 TILES

7527 BRICKS



Abiga



URBAN BREAKUP

Richard Nelson









ELLIPSES



CANE

IRREGULAR DOTS



BUBBLES SMALL Mitel

DOT BREAKUP (LG)



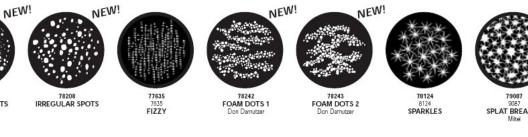
DOT BREAKUP (MED)



FOAM



DOT BREAKUP (SM)



WEB LINK TO VIEW See more designs for this category on the Rosco website: MORE DESIGNS http://www.rosco.com/gobos/abstract

SPLAT BREAKUP

SMALL SQUARES

CHESSBOARD

CHEQUERED FLAG 3

ELLIPSE 1





∩∎sco

			Ar	mage ea (IA)	ST	EEL		GL	ASS	S	PECTRU	MGOBOS	***
SIZE	STEEL SIZE LETTEI CODE	R FIXTURE TYPE/GOBO SIZE		Diam Diam OD) ETER (mm) IA	STANDARD STEEL	CUSTOM STEEL	SILK SCREEN GLASS	COLORIZERS"	PRISMATICS ^{m11} IMAGE GLASS ^{m11} COLORWAVES ¹¹¹ (All require Iris Slot Gobo Hodder)	SIGNATURE SERIES	BLACK AND WHITE	ONE COLOR	TWO COLOR, MULTI-COLOR (Requires Iris Sot Holder)
1000	А	A Size	100	75	Х	Х	Х				Х	Х	Х
0860	В	B Size	86	64.5	Х	Х	Х	Х	х	Х	Х	Х	Х
0790	BG	BSize Glass (Obsolete)*	79	64.5	0	0	0	0	0	Х	0	0	0
0660	М	M Size (S4 Jr.)	66	49.5	Х	Х					Х	х	P
0533	D	D Size (Steel)	53.3	40	Х	Х					Х	Х	
0518		Clay Paky Stage Scan, Zoom	51.8	48		Х		0	0	х	Х	Х	X
0495		Martin PAL 1200	49.5	38		Х		0	0	Х	Х	Х	Х
0445	СҮВ	HES Cyberlight	44.25	38	Х	Х		0	0	х	Х	Х	X
0375	E	E Size	37.5	28	Х	Х		0	0	Х	Х	Х	Х
0363		HES Studiospot 575	36.3	31.5	0	Х				0	Х	х	X
0315		Clay Paky VIP	31.5	23	0	Х				0	Х	Х	X
0278	MAC	Martin Mac 500, 918	27.8	23	Х	Х				0	Х	х	X
0215		Martin MAC 250	22.25	17	0	Х				0	Х	Х	Х
2514	M518	Martin 518	25	14	Х	Х				0	Х	х	X
0250	V	HES Technobeam, Studiospot 250	25	22-20	X**	Х				0	Х	Х	X
0250	V	CP Mini-Scan HPE, Stagelight 300	25	22-20	Х**	х				0	х	х	X
0250	V	Trackspot	25	18	Х	Х				0	Х	Х	
0250	V	HES Intellibeam (Steel)	25	18	Х	х				0		0	
2039		HES Intellibeam (Glass)	29	18							Х	Х	
0250	V	Vari*Lite VL1	25	18	Х	Х						х	X
2039	VL2/6	Vari*Lite VL2	SPEC	SPEC	Х	Х						Х	Х
2039	VL2/6	Vari*Lite VL6	SPEC	SPEC	х	Х						Х	X
2039		Vari*Lite VL7			0	Х					х	Х	
6699		Generic Custom 66-99MM O.D.	VAR	VAR		Х					Х	Х	P
4065		Generic Custom 40-65MM O.D.	VAR	VAR		Х					Х	Х	Р
2039		Generic Custom 20-39MM O.D.	VAR	VAR		Х					х	Х	P
KEY:	0	 Available Available by special order. Contact R Possible. Requires sizing ring. Contact 							 Image Area reduced to Maximum wattage is 250 Maximum wattage is 100 	0W at 208V	-	-	<u>.</u>

P – Possible. Requires sizing ring. Contact Rosco for details.
 BG Size (obsolete) glass gobos require Effects Adapters (No. 50000) for use in Rosco Gobo Rotators

Maximum wattage is 1000W at 120V, 1250W at 220V
 Aximum wattage is 600W for Lekos, 1200W for moving lights.

For the latest list of gobo sizes and compatibility information, check the Rosco web site at: http://www.rosco.com/gobocatalog/support/lixtures.html

L etter Size A 3 M	O.D. 100mm 86mm 66mm	I.A. 75mm 64.5mm	Size B BG	O.D. 86mm	I.A./BW 64.5mm	I.A./MC 59mm
3 M	86mm	64.5mm	-		64.5mm	59mm
			BG			
	66mm		20	79mm	64.5mm	59mm
		49.5mm	M	66mm	49.5mm	39mm
D	53.3mm	48mm	Clay Paky HPE	51.8mm	48mm	39mm
Cyber 4	44.25mm	38mm	Martin PAL	49.5mm	38mm	31.mm
<u> </u>	37.5mm	28mm	Cyber	44.25mm	38mm	31mm
Mac 500	27.8mm	23mm	Mac 2000	37.5mm	28mm	22mm
/	25.5mm	18mm	Studio Spot 575	36.3mm	31.5mm	22mm
			Mac 500	27.8mm	23mm	17mm
			V	25.5mm	18mm	16mm
			Mac250	22.5mm	18mm	14mm

Fixture Type EX3

FLATBACK CYLINDERS - LINE VOLTAGE & LOW VOLTAGE

PRODUCT HIGHLIGHTS

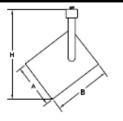
FB

- Variety of sizes for use with A-lamps, PAR lamps, reflector lamps and MR-16 miniature (low voltage) lamps.
- · Traditional flatback cylinder styling.
- · Recessed lamp position provides excellent lamp shielding cutoff.
- On / Off switch for simple fixture control and ease of relamping.
- Available in white or black cylinder finish with black baffle.
- Low voltage units and large PAR38 fotures come with yoke mounting. PAR20 and PAR30 units are stem-mounted
- · Low voltage units include transformer built into housing.
- CONSTRUCTION Cylinder constructed of high quality drawn steel. Yoke stamped from #16 C.R.S. Polyester powder coat paint finish.
- ADAPTER / STEM Polycarbonate. Two-position 'hot' contact allows use with either one or two circuit track. Thumb slide-lock provides secure connection to track.
- AIMING Finger screw-lock for precise aiming. 355-degree rotation capability.
- LISTING UL listed to U.S. and Canadian safety standards for use with LSI one and two circuit track.





DIMENSIONS



Fixiure	Diameter (A)	Leng i h (B)	Max. Height (H)
PAR20	3 1/2*	6 1/8"	9 1/2°
PAR30	4 1/2*	7 1/8*	11 1/4"
PAR38	5 3/4°	8 1/8"	12 1/2*
MR16	3 1/2*	6"	6 1/4"

FIXTURE ORDERING INFORMATION

Head Style	Light Source	Color
Line Voltage FB	20 - PAR20 (50w max) or R20 (75w max) 30 - PAR30 (75w max) or BR30 (65w max) 38 - PAR38 (250w max) or BR40 (120w max)	W - White B - Black
Low Voltage FBL	16 - MR16 (50w max)	
FB	30	Ŵ

ACCESSORY INFORMATION (Order Separately) Choose the accessory that corresponds with your lamp type

Lamp Reference	Holder	Barn Doors	Lowar
PAR20	AH-20	BD-20	L-20
PAR30	AH-30	BD-30	L-30
PAR38	AH-38	BD-38	L-38
MR16	AH-20	BD-20	L-20

Project Name______ Fixture Type ______ © 2006 LSI INDUSTRIES INC.

Lamp EX3



Order Abbreviation: 50PAR30/CAP/IR/NFL25 120V

General Description: Tungsten Halogen CAPSYLITE IR PAR30 Reflector Lamp Medium Base 50Watt 120Volt Narrow

Product Information				
Abbrev. With Packaging Info.	50PAR30CAPIRNFL25 120V 15/CS 1/SKU			
Approx. Lumens	900			
Average Rated Life (hr)	3000			
Base	E26 Medium			
Beam Angle (deg)	25			
Beam Type	NFL			
Bulb	PAR30			
Centerbeam Candlepower (cp)	2900			
Class	C (gas)			
Color Rendering Index (CRI)	100			
Color Temperature/CCT (K)	2825			
Diameter (in)	3.75			
Diameter (mm)	95.25			
Ecologic	YES			
Family Brand Name	CAPSYLITE® IR® PAR30			
Filament	CC-8			
Horizontal Beam Angle (deg)	25			
Maximum Overall Length - MOL (in)	3.625			
Maximum Overall Length - MOL (mm)	92.075			
Nominal Voltage (V)	120.00			
Nominal Wattage (W)	50.00			
Vertical Beam Angle (deg)	25			

Fixture Type C1

ROCKET I INDUSTRIAL OPEN LOWBAY



TYPE:		PI	ROJECT:	
ORDER N	UMBER:			
Model#	Lamp Qty.	Wattage	Ballast	Options
7713	1, 2, 3	26-42 CF	UE, SS	D2, D4, D5, EM
	1, 2	57 CF		CM 1
7713	1 I	70,100 MH	MH1, MH2	Q1, Q2
	1	150мн		
7713	1	INC150W		
	1	85 QL	QL1 120V or	



COMPACT FLUORESCENT

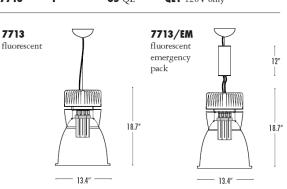
Housing is .063 spun matte anodized aluminum. Canopy mounts to standard J-boxes; suspends from aircraft cables with push button gliders; and supplied with 6 foot power cord. Order **CM1** pipe mount for outdoors. Sockets and ballasts operate 26, 32 and 42 watt triple tubes; voltage is 120 thru 277V. Separate switching **SS**, dimming ballasts **D**and emergency battery pack **EM** Voltage must be specified. U.L. listed for damp locations.

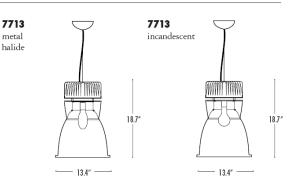
METAL HALIDE/ INCANDESCENT

Housing is .063 spun matte anodized aluminum. Canopy mounts to standard J-boxes; suspends from aircraft cables with push button gliders; and supplied with 6 foot power cord. Incanclescent 150W max. Metal halide ballasts are electronic, for use with medium base, ceramic arc tube lamps rated for open fixtures. For quartz restrike, order **Q1** for 120V and **Q2** for 277V. U.L. listed for damp locations.

QL INDUCTION

Housing is .063 spun matte anodized aluminum. Canopy mounts to standard J-boxes; suspends from aircraft cables with push button gliders; and supplied with 6 foot power cord. The HF generator is electronic component connected to a discharge vessel via a shielded triaxial cable and supplied standard in 120V only for the 85W lamp. U.L. listed for damp locations.





7713 QL induction

BURBANK,

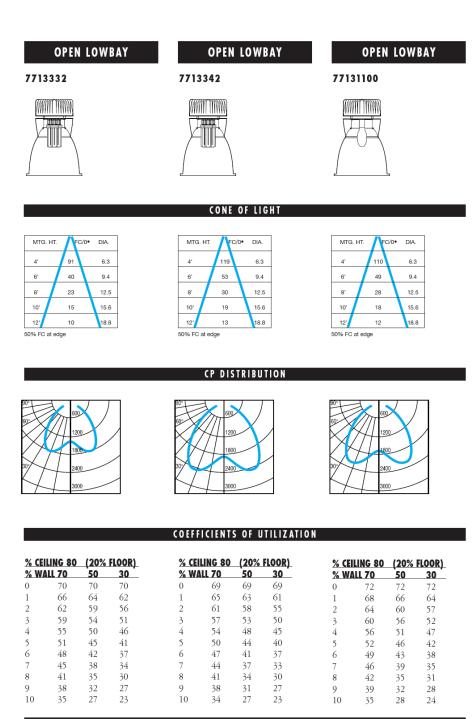
- CALIFORNIA,
- 91505

WWW.

DELRAY

LIGHTING.

COM



7713332

3-32 watt triple tube G24q-3 socket Total lumens-7200 Spacing criteria-1.4

NOTES

7713342 3-42 watt triple tube G24q-4 socket Total lumens-9600 Spacing criteria-1.4 **77131100** 1-100 watt ED17 medium base socket Total lumens-6800 Spacing criteria-1.4

BALLASTS

FLUORESCENT BALLASTS

UE Universal electronic wattage: 26, 32 and 42 voltage: 120 thru 277 All UE and SS models have sockets and ballasts that operate 26, 32 and 42 watt lamps.

SS Separate switching for 3 lamps

DIMMING NOTES:

Due to different operating temperatures, please review number of lamps that can be used per manufacturers ballast before ordering dimming.

DIMMING BALLASTS

D3 Advance Mark X wattage: 1,2or 3-26,32,42 or 1-57 voltage: 120 or 277 voltage must be specified range: 5% - 100% control wires: none dimmers: standard incandescent recommended Advance C500A

D4 Lutron Tu-Wire

Scene control dimming wattage: 1-32, 2-32, voltage: 120 only range: 5% - 100% control wires: none dimmers: Lutron Grafik Eye, Nova T, Diva, Skylark

D5 Advance Mark VII wattage: 1,2or 3-26,32,42 or 1-57,70

voltage: 120 or 277 voltage must be specified range: 5% - 100% control wires: 2 low voltage dimmers: 1-10V analog

METAL HALIDE BALLASTS

MH.1 120V electronic MH.2 277V electronic Metal Halide Ballasts are electronic, square wave type for use with ceramic arc tube, color corrected lamps rated for open and enclosed fixtures.

EXTERIOR LOCATIONS

For suspending out side or for any windy location that could cause oscillation, you must order the pipe mount option. Pipe is 7/8" O.D. and is mounted to an earthquake canopy. Pipe replaces power cord and cable. Length of pipe must be specified.

CM1 pipe mount

Lamp Type C1



Product Number: 20871

 Order Abbreviation:
 CF42DT/E/IN/835/ECO

 General Description:
 DULUX 42W triple comp with electronic and dim

DULUX 42W triple compact fluorescent amalgam lamp with 4-pin base, integral EOL, 3500K color temperature, 82 CRI, for with electronic and dimming ballasts, ECOLOGIC

Product Information					
Abbrev. With Packaging Info.	CF42DTEIN835ECO 50/CS 1/SKU				
Average Rated Life (hr)	12000				
Base	GX24Q-4				
Bulb	Т (Т4)				
Color Rendering Index (CRI)	82				
Color Temperature/CCT (K)	3500				
Family Brand Name	Dulux® EL				
Initial Lumens at 25C	3104				
Mean Lumens at 25C	2670				
Maximum Overall Length - MOL (in)	6.5				
Maximum Overall Length - MOL (mm)	163				
NEMA Generic Designation (current)	CFTR/42W/GX24Q/835				
Nominal Wattage (W)	42.00				
	A difficient Dave developed to former affects				

Additional Product Information
Product Documents, Graphs, and Images
Compatible Ballast
Packaging Information

Ballast C1



Electrical Specifications

IZT-2T42-M3-BS@120						
Brand Name	MARK 7 0-10V					
Ballast Type	Electronic Dimming					
Starting Method	Programmed Start					
Lamp Connection	Series					
Input Voltage	120-277					
Input Frequency	50/60 HZ					
Status	Active					

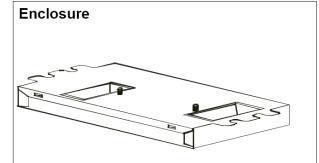
Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (Watts) (min/max)	Ballast Factor (min/max)	MAX THD %	Power Factor	Lamp Current Crest Factor	B.E.F.
CFM32W/GX24Q	2	32	50/10	0.63	19/75	0.05/1.00	10	0.99	1.4	1.33
* CFM42W/GX24Q	2	42	50/10	0.82	18/98	0.05/1.00	10	0.99	1.4	1.02
CFTR57W/GX24C	1	57	50/10	0.55	18/66	0.05/1.00	10	0.99	1.7	1.52
CFTR70W/GX24C	1	70	50/10	0.67	18/80	0.05/1.00	10	0.99	1.7	1.25



the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

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



Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
6.28 "	3.00 "	1.29 "	2.00 "
6 7/25	3	1 29/100	2
16 cm	7.6 cm	3.3 cm	5.1 cm

Revised 08/27/2003



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

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



Electrical Specifications

IZT-1T42-M2-BS@120

Brand Name	MARK 7 0-10V
Ballast Type	Electronic Dimming
Starting Method	Programmed Start
Lamp Connection	Series
Input Voltage	120-277
Input Frequency	50/60HZ
Status	Active

Input Power Lamp Type Num. Rated Min. Input Ballast Factor MAX Power Lamp B.E.F. of Lamp Start Current (Watts) (min/max) THD Factor Current Lamp Watts Temp (Amps) (min/max) % **Crest Factor** (°F/C) s CFM26W/GX24Q 1 26 50/10 0.25 08/29 0.05/1.00 14 0.95 1.4 3.45 CFM32W/GX24Q 50/10 0.33 09/39 0.05/1.00 2.56 1 32 10 0.97 1.4 * CFM42W/GX24Q 50/10 0.42 09/50 0.05/1.00 10 0.98 1.4 2.00 1 42 CFQ26W/G24Q 08/29 1 26 50/10 0.25 0.05/1.00 14 0.95 1.4 3.45

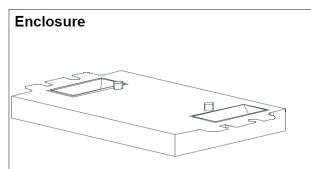


Green Terminal must be Grounded

The wiring diagram that appears above is for the lamp type denoted by the asterisk $({}^{\ast})$

Standard Lead Length (inches)

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



Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
4.98 "	3.00 "	1.29 "	2.00 "
4 49/50	3	1 29/100	2
12.6 cm	7.6 cm	3.3 cm	5.1 cm

Revised 06/18/2003

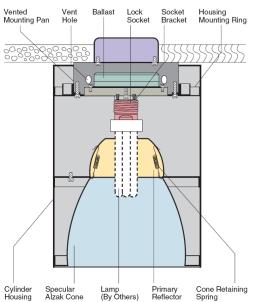


Data is based upon tests performed by Advance Transformer in a controlled environment and representative of relative performance. Actual performance can vary depending on operating conditions. Specifications are subject to change without notice. All specifications are nominal unless otherwise noted.

ADVANCE

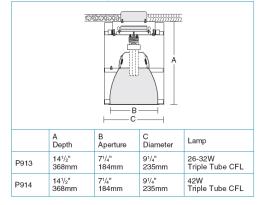
O'HARE INTERNATIONAL CENTER · 10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018 Customer Support/Technical Service: Phone: 800-372-3331 · Fax: 630-307-3071 Corporate Offices: Phone: 800-322-2086

Fixture Type C2





Dimensions and Lamps



P913 One 26-32W Triple Tube Lamp **P914** One 42W Triple Tube Lamp

Surface Mount Cylinder 7¹/₄" Conoid Apertures

Optics and Applications

The two element optical systems have computer designed primary reflectors and parabolic low brightness shielding cones. Distribution from a single vertically mounted triple tube lamp is for general and task lighting. Spacing to mounting height ratios range from .76 to .97 depending upon which lamp is mounted. Use in corridors, entries, over work stations, or for open area lighting.

Design Features

Twist and lock sockets prevent the lamps from falling if not properly engaged. They are a dependable fail-safe mechanism to prevent litigation.

Finish

Specular clear Alzak cones are standard. Optional colors and Softglow® finishes are available. Interiors are optical matte black, the exterior is matte white baked enamel.

Ballasts

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

General

Fixtures are UL and C-UL listed for thermal and electrical safety. Union made IBEW. Luminaire Efficiency Rating (LER) data is in the photometric directory located in Section Z.

CC

Ρ5

ES

WT White trim flange.

WHT White complete trim.

BA Brushed aluminum.

Custom color.

Extra stem length,

Pendant adaptor, 21" length.

Accessories G

- Gold cone.
- Н Mocha cone.
- Graphite cone. Ρ
- Titanium cone. т
- W Wheat cone.
- Pewter cone. Υ
- Bronze cone. Ζ

Μ

S

- specify length.
- Wall or column mount. V347 347 volt ballast.
- Softglow® finishes: add S before color letters. e.g. SW
- for Softglow® wheat cone, SC for Softglow® clear cone. DM Dimming ballast, contact the factory.
- Emergency power. Includes battery pack, charger light, ΕM test switch and single lamp operation for 90 minutes.
- Components are remote from fixture. Specify volts. WRL Wattage restriction label, specify wattage.

Matching Units

Recessed cross baffled Recessed downlights Recessed wall washers

Page P24 Pages P53, P54, P55 Pages P64, P65, P66

** Click for link to pages in blue.



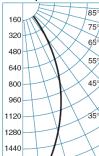
P4

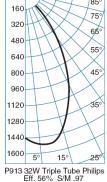
P41 P913 P914

Performance Datachart

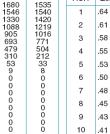
				•							
Single Unit Initial Footcandles, 30" Work Plane			ane	Ceiling to Floor	Multiple Units Initial Footcandles, 30" Work Plane						
		N Osram Triple Tube Re V Osram Triple Tube Rea						Ceiling 80%	% Walls 509	% Floor 20	%
Nadir	1	10°	2	20°	3	30°		Spacing is	Maximum O	ver Work Pla	ane
FC	FC	Diam	FC	Diam	FC	Diam		Spacing	RCR 1	RCR 3	RCR 8
55 73	49 65	2' 2'	30 39	4' 4'	15 19	<mark>6'</mark> 6'	8'	4' 4'	78 112	68 97	50 71
<mark>29</mark> 39	26 35	3' 3'	16 21	5' 5'	8 10	9' 9'	10'	6' 6'	42 60	36 52	27 38
18 25	16 22	3' 3'	10 13	7' 7'	5 6	11' 11'	12'	7' 7'	26 37	23 33	17 24
13 17	11 15	4' 4'	7 9	8' 8'	3 4	13' 13'	14'	9' 9'	18 26	16 22	11 16
9 12	8 11	5' 5'	5	10' 10'	23	16' 16'	16'	11' 10'	13 19	11 16	8 12

Candlepower Distribution





$\begin{array}{c c c c c c c c c c c c c c c c c c c $		Candelas											
5 0 1657 1421 5 1680 1535 10 1546 1540 15 1330 1420 25 905 1016 25 905 1016 15 905 1016 15 479 504 40 310 212 45 53 33	35°		O 32W	P 32W									
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	75°	0	2400*	2400*									
	5° 55° 15°	10 15 20 25 30 35 40 45 50 55 60 65 70 75 80	1680 1546 1330 1088 905 693 479 310	1535 1540 1420 1219 1016 771 504 212 33 8									



Ceiling	80%			70%		50%		30%		0	
Wall %	70	50	30	10	50	10	50	10	50	10	0
RCR	Zor	nal Ca	avity	Meth	od - F	loor	Refle	ctan	ce 20	%	
1	.64	.63	.61	.60	.61	.59	.59	.57	.57	.55	.53
2	.61	.58	.56	.54	.57	.54	.56	.53	.54	.51	.49
3	.58	.55	.52	.50	.54	.49	.52	.49	.51	.48	.46
4	.55	.51	.48	.46	.51	.46	.49	.45	.48	.45	.43
5	.53	.48	.45	.43	.48	.42	.47	.42	.46	.42	.40
6	.50	.45	.42	.40	.45	.39	.44	.39	.43	.39	.38
7	.48	.43	.39	.37	.42	.37	.41	.37	.41	.36	.35
8	.45	.40	.37	.35	.40	.35	.39	.34	.39	.34	.33
9	.43	.38	.35	.32	.38	.32	.37	.32	.37	.32	.31
10	.41	.36	.33	.31	.36	.31	.35	.30	.35	.30	.30
P913 On P913 On							/ania	x .95	5		

70%

70 50 30 10 50 10 50 10 50 10

.45 .41 .37 .35 .40 .35 .40 .35 .39 .35 .34

.41 .36 .33 .31 .36 .31 .36 .31 .35 .31 .30

.39 .34 .31 .29 .34 .29 .34 .29 .33 .29 .28

Zonal Cavity Method - Floor Reflectance 20%

.52

.33

50%

.58 .56 .56 .55 .54 .53 .50

.43 .38 .42 .37 .41 .37 .36

.38 .33 .37 .33 .37 .33 .32

.46 .49

.55 .51 .53 .50 .51

30% 0

0

.49 .47

.46 .44

Coefficients of Utilization

See notes 4 and 5.

15° P913 32W Triple Tube Osram Eff. 55% S/M .78

25

350

525

700

875

1050

1225

1400

1575

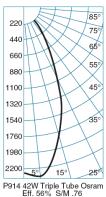
1750

5

15°

P914 42W Triple Tube Philips Eff. 46% S/M .92

1600



85 175

O 42W P 42W 0 3200* 3200* 75 2221 2284 2071 1771 1414 1134 891 1574 1721 65 1695 1552 55 1294 1047 785 45

Vertical Angles
 * Initial Lamp Lumens

P914 One 42W Triple Tube Osram Sylvania P914 One 42W Triple Tube Philips x .84 Vertical Angles Initial Lamp Lumens

.43 .38 .35

80%

.61 .60 .58 .57

.48 .43 .40 .38

58 56 .54

.55 .52 .49 .47 .51 .47 .50

Notes

Ceiling

Wall %

RCR

1

2

3

4 .53 .49 .46 .44 .48 .43 .47 .43 .46 .42 .41

5 .50 .46 .43 .41 .45 .40 .44 .40 .43 .40 .39

6 7

8

9

10

- 1 Data on all charts calculated with a clear specular cone finish. 2 Specular cone multipliers: Wheat x .84, Pewter x .74, Mocha x .74, Graphite x .71, Titanium x .71, Bronze x .67.
- 3 Softglow[®] cone multipliers: Wheat x .71, Pewter x .65,
- Mocha x .65, Graphite x .63, Titanium x .63, Bronze x .61.
- A Single unit Datachart pattern diameters are determined by the number of degrees from each side of nadir. Therefore a 20° diameter represents a total 40° pattern width at the work plane 30° above the floor. Footcandle values are at the edge of that diameter. Datachart spacing is rounded off to the nearest foot.
- 5 Compact fluorescent data vary due to lamp lumen differences power input, burning position, ambient temperature and ballast characteristics. A modification factor should be applied.
- 6 Brightness data from the Average Luminance Method are inaccurate for small aperture downlights. They are theoretical calculations derived for large surfaces such as troffers. For a complete discussion refer to section Z brochure Z1.

Number Lamps

Brightness

Lamps	85°	75°	65°	55°	45°
32W Osram Sylvania Triple Tube	8	29	49	145	8831
32W Philips Triple Tube	10	30	52	134	6900
42W Osram Sylvania Triple Tube	12	40	67	199	11298
42W Philips Triple Tube	14	40	71	178	9022
	32W Osram Sylvania Triple Tube 32W Philips Triple Tube 42W Osram Sylvania Triple Tube	32W Osram Sylvania Triple Tube 8 32W Philips Triple Tube 10 42W Osram Sylvania Triple Tube 12	32W Osram Sylvania Triple Tube82932W Philips Triple Tube103042W Osram Sylvania Triple Tube1240	32W Osram Sylvania Triple Tube8294932W Philips Triple Tube10305242W Osram Sylvania Triple Tube124067	32W Osram Sylvania Triple Tube 8 29 49 145 32W Philips Triple Tube 10 30 52 134 42W Osram Sylvania Triple Tube 12 40 67 199

Data in footlamberts. Photometer readings, Maximum Brightness Method. See note 6.

👫 Kurt Versen Company, Westwood, New Jersey

Lamp Type C2



Product Number: 20885

Order Abbreviation:	CF32DT/E/IN/835/ECO
General	DULUX 32W triple compact flu
Description:	with electronic and dimming b

DULUX 32W triple compact fluorescent amalgam lamp with 4-pin base, integral EOL, 3500K color temperature, 82 CRI, for use with electronic and dimming ballasts, ECOLOGIC

Product Information								
Abbrev. With Packaging Info.	CF32DTEIN835ECO 50/CS 1/SKU							
Average Rated Life (hr)	12000							
Base	GX24Q-3							
Bulb	Т (Т4)							
Color Rendering Index (CRI)	82							
Color Temperature/CCT (K)	3500							
Family Brand Name	Dulux® T/E							
Industry Standards	IEC 60901- 7432							
Initial Lumens at 25C	2328							
Mean Lumens at 25C	2002							
Maximum Overall Length - MOL (in)	5.6							
Maximum Overall Length - MOL (mm)	142							
NEMA Generic Designation (current)	CFTR32W/GX24Q/835							
NEMA Generic Designation (old)	CFM32W/GX24Q/835							
Nominal Wattage (W)	32.00							

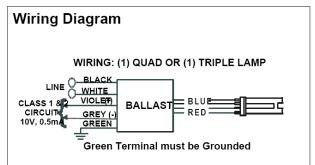
Ballast Type C2



Electrical Specifications

IZT-1T42-M2-BS@120								
Brand Name	MARK 7 0-10V							
Ballast Type	Electronic Dimming							
Starting Method	Programmed Start							
Lamp Connection	Series							
Input Voltage	120-277							
Input Frequency	50/60HZ							
Status	Active							

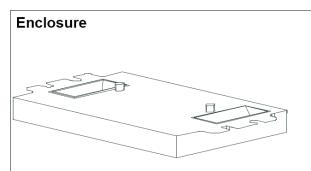
Lamp Type	Num. of Lamp s	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (Watts) (min/max)	Ballast Factor (min/max)	MAX THD %	Power Factor	Lamp Current Crest Factor	B.E.F.
CFM26W/GX24Q	1	26	50/10	0.25	08/29	0.05/1.00	14	0.95	1.4	3.45
* CFM32W/GX24Q	1	32	50/10	0.33	09/39	0.05/1.00	10	0.97	1.4	2.56
CFM42W/GX24Q	1	42	50/10	0.42	09/50	0.05/1.00	10	0.98	1.4	2.00
CFQ26W/G24Q	1	26	50/10	0.25	08/29	0.05/1.00	14	0.95	1.4	3.45



The wiring diagram that appears above is for the lamp type denoted by the asterisk $(\ensuremath{^*})$

Standard Lead Length (inches)

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



Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
4.98 "	3.00 "	1.29 "	2.00 "
4 49/50	3	1 29/100	2
12.6 cm	7.6 cm	3.3 cm	5.1 cm

Revised 06/18/2003

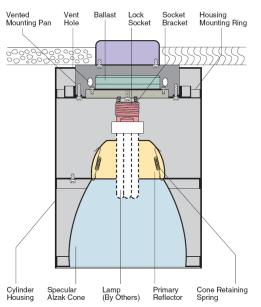


Data is based upon tests performed by Advance Transformer in a controlled environment and representative of relative performance. Actual performance can vary depending on operating conditions. Specifications are subject to change without notice. All specifications are nominal unless otherwise noted.

ADVANCE

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

Fixture Type C3





Dimensions and Lamps

	23			
	A Depth	B Aperture	C Diameter	Lamp
P913	14¹/₂"	7¹/₄"	9 ¹ /4"	26-32W
	368mm	184mm	235mm	Triple Tube CFL
P914	14½"	7¹/₄"	9 ^{1/} 4"	42W
	368mm	184mm	235mm	Triple Tube CFL

Surface Mount Cylinder 71/4" Conoid Apertures

Optics and Applications

The two element optical systems have computer designed primary reflectors and parabolic low brightness shielding cones. Distribution from a single vertically mounted triple tube lamp is for general and task lighting. Spacing to mounting height ratios range from .76 to .97 depending upon which lamp is mounted. Use in corridors, entries, over work stations, or for open area lighting.

Design Features

Twist and lock sockets prevent the lamps from falling if not properly engaged. They are a dependable fail-safe mechanism to prevent litigation.

Finish

Specular clear Alzak cones are standard. Optional colors and Softglow® finishes are available. Interiors are optical matte black, the exterior is matte white baked enamel.

Ballasts

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

General

Fixtures are UL and C-UL listed for thermal and electrical safety. Union made IBEW. Luminaire Efficiency Rating (LER) data is in the photometric directory located in Section Z.

BA

CC

WT White trim flange.

WHT White complete trim.

Custom color.

specify length.

Brushed aluminum.

Extra stem length,

Pendant adaptor, 21" length.

Accessories G

- Gold cone.
- Н Mocha cone.
- Ρ Graphite cone.
- Titanium cone. Т
- W Wheat cone.
 - P5 ES
- Υ Pewter cone.
- Ζ Bronze cone. Μ

S

- Wall or column mount. V347 347 volt ballast.
 - Softglow® finishes: add S before color letters. e.g. SW for Softglow[®] wheat cone, SC for Softglow[®] clear cone.
- DM Dimming ballast, contact the factory.
- EM Emergency power. Includes battery pack, charger light, test switch and single lamp operation for 90 minutes. Components are remote from fixture. Specify volts.

WRL Wattage restriction label, specify wattage.

Matching Units

Recessed cross baffled Recessed downlights Recessed wall washers

Page P24 Pages P53, P54, P55

Pages P64, P65, P66

** Click for link to pages in blue



P4

P41 P913 **P914**

Performance Datachart

Single Unit	Initial	Footca	ndles,	30" Wo	ork Pla	ane	Ceiling to Floor	Multiple Units Initial Footcandles, 30" Work Plane			
P913 One 3 P914 One 42								Ceiling 80%	6 Walls 509	% Floor 209	%
Nadir 10° 20° 30°			0°		Spacing is	Maximum O	ver Work Pla	ine			
FC	FC	Diam	FC	Diam	FC	Diam		Spacing	RCR 1	RCR 3	RCR 8
55	49	2'	<mark>30</mark>	4'	15	6'	8'	4'	78	<mark>68</mark>	50
73	65	2'	39	4'	19	6'		4'	112	97	71
29	26	3'	16	5'	8	9'	10'	6'	42	36	27
39	35	3'	21	5'	10	9'		6'	60	52	38
18	16	3'	10	7'	5	11'	12'	7'	26	23	17
25	22	3'	13	7'	6	11'		7'	37	33	24
13	11	4'	7	8'	3	13'	14'	9'	18	16	11
17	15	4'	9	8'	4	13'		9'	26	22	16
9	8	5'	5	10'	2	16'	16'	11'	13	11	8
12	11	5'	6	10'	3	16'		10'	19	16	12

Candlepower Distribution

85° 160 75° 320 65° 480 55 640 45° 800 960 35 1120 1280 1440 1600 15° 25 P913 32W Triple Tube Osram Eff. 55% S/M .78

220

440

660

880

1100

1320

1540

1760

1980

2200

85°

75°

65

55

45°

35

25

175

350

525

700

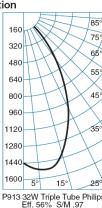
875

1050

1225

1400

1575 1750



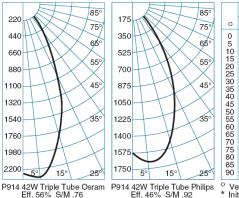
35°		O 32W	P 32W
75%	0	2400*	2400*
35° 55° 45° 35°	0 5 10 15 20 25 30 35 40 55 60 65 70 75 80 85 90	$\begin{array}{c} 1657\\ 1680\\ 1546\\ 1330\\ 1088\\ 905\\ 693\\ 479\\ 310\\ 53\\ 9\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\$	1421 1535 1540 1420 1219 1016 771 504 212 33 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0
ilins	° Ve	artical And	les

Candelas

* Initial Lamp Lumens

3200*

O 42W P 42V



5	0 *	Vertical Angles Initial Lamp Lumens
---	--------	--

P914 One	42W	Triple	Tube	Osran	n Sylv	ania	
Det 4 Olic	1014	Tipic	Tube	DUT	1 Oyliv	, and	
P914 One	4200	Iriple	LUDE	Philips	SX 84	1	

Notes

- 1 Data on all charts calculated with a clear specular cone finish. 2 Specular cone multipliers: Wheat x .84, Pewter x .74, Mocha x .74, Graphite x .71, Titanium x .71, Bronze x .67.
- 3 Softglow[®] cone multipliers: Wheat x .71, Pewter x .65, Mocha x .65, Graphite x .63, Titanium x .63, Bronze x .61.
- 4 Single unit Datachart pattern diameters are determined by the number of degrees from each side of nadir. Therefore a 20° diameter represents a total 40° pattern width at the work plane 30° above the floor. Footcandle values are at the edge of that diameter. Datachart spacing is rounded off to the nearest foot.
- 5 Compact fluorescent data vary due to lamp lumen differences, power input, burning position, ambient temperature and ballast characteristics. A modification factor should be applied.
- 6 Brightness data from the Average Luminance Method are inaccurate for small aperture downlights. They are theoretical calculations derived for large surfaces such as troffers. For a complete discussion refer to section Z brochure Z1.

Brightn	ess
Muuna la an	1

15°

Number	Lamps	85°	75°	65°	55°	45°
P913	32W Osram Sylvania Triple Tube	8	29	49	145	8831
1910	32W Philips Triple Tube	10	30	52	134	6900
P914	42W Osram Sylvania Triple Tube	12	40	67	199	11298
1 3 1 4	42W Philips Triple Tube	14	40	71	178	9022

5

Data in footlamberts. Photometer readings, Maximum Brightness Method. See note 6.



🚯 Kurt Versen Company, Westwood, New Jersey

See notes 4 and 5.

Coeffi	cier	nts d	of U	tiliz	atio	n					
Ceiling	80%				70)%	50)%	30	0	
Wall %	70	50	30	10	50	10	50	10	50	10	0
RCR	Zor	nal Ca	avity	Meth	od - F	loor	Refle	ctan	ce 20	%	
1	.64	.63	.61	.60	.61	.59	.59	.57	.57	.55	.53
2	.61	.58	.56	.54	.57	.54	.56	.53	.54	.51	.49
3	.58	.55	.52	.50	.54	.49	.52	.49	.51	.48	.46
4	.55	.51	.48	.46	.51	.46	.49	.45	.48	.45	.43
5	.53	.48	.45	.43	.48	.42	.47	.42	.46	.42	.40
6	.50	.45	.42	.40	.45	.39	.44	.39	.43	.39	.38
7	.48	.43	.39	.37	.42	.37	.41	.37	.41	.36	.35
8	.45	.40	.37	.35	.40	.35	.39	.34	.39	.34	.33
9	.43	.38	.35	.32	.38	.32	.37	.32	.37	.32	.31
10	.41	.36	.33	.31	.36	.31	.35	.30	.35	.30	.30

P913 One 32W Triple Tube Philips P913 One 32W Triple Tube Osram Sylvania x .95

P 42W	Ceiling		80)%		70)%	50	1%	30)%	0
3200*	Wall %	70	50	30	10	50	10	50	10	50	10	0
1574 1721	RCR	Zon	alCa	avity l	Meth	od - F	loor	Refle	ctanc	e 20	%	
1695	1	.61	.60	.58	.57	.58	.56	.56	.55	.54	.53	.50
1552 1294	2	.58	.56	.54	.52	.55	.51	.53	.50	.51	.49	.47
1047 785	3	.55	.52	.49	.47	.51	.47	.50	.46	.49	.46	.44
544 276	4	.53	.49	.46	.44	.48	.43	.47	.43	.46	.42	.41
276 38 9 0	5	.50	.46	.43	.41	.45	.40	.44	.40	.43	.40	.39
	6	.48	.43	.40	.38	.43	.38	.42	.37	.41	.37	.36
0 0	7	.45	.41	.37	.35	.40	.35	.40	.35	.39	.35	.34
0 0	8	.43	.38	.35	.33	.38	.33	.37	.33	.37	.33	.32
Ŏ O	9	.41	.36	.33	.31	.36	.31	.36	.31	.35	.31	.30
0	10	.39	.34	.31	.29	.34	.29	.34	.29	.33	.29	.28

Lamp Type C3



Order Abbreviation: CF42DT/E/IN/835/ECO General DULUX 42W triple com; with electronic and dim

Product Number: 20871

DULUX 42W triple compact fluorescent amalgam lamp with 4-pin base, integral EOL, 3500K color temperature, 82 CRI, for us with electronic and dimming ballasts, ECOLOGIC

	Product Information
Abbrev. With Packaging Info.	CF42DTEIN835ECO 50/CS 1/SKU
Average Rated Life (hr)	12000
Base	GX24Q-4
Bulb	Т (Т4)
Color Rendering Index (CRI)	82
Color Temperature/CCT (K)	3500
Family Brand Name	Dulux® EL
Initial Lumens at 25C	3104
Mean Lumens at 25C	2670
Maximum Overall Length - MOL (in)	6.5
Maximum Overall Length - MOL (mm)	163
NEMA Generic Designation (current)	CFTR/42W/GX24Q/835
Nominal Wattage (W)	42.00
	Additional Product Information
Product Documents, Graphs, and Images	
<u>Compatible Ballast</u>	

Packaging Information

Ballast Type C3

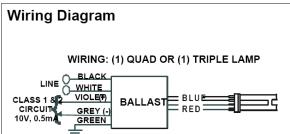


. - -ATAO NO DOGAOO

Electrical Specifications

IZI-1142-N	12-BS@120
Brand Name	MARK 7 0-10V
Ballast Type	Electronic Dimming
Starting Method	Programmed Start
Lamp Connection	Series
Input Voltage	120-277
Input Frequency	50/60HZ
Status	Active

Lamp Type	Num. of Lamp s	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.
CFM26W/GX24Q	1	26	50/10	0.25	08/29	0.05/1.00	14	0.95	1.4	3.45
CFM32W/GX24Q	1	32	50/10	0.33	09/39	0.05/1.00	10	0.97	1.4	2.56
* CFM42W/GX24Q	1	42	50/10	0.42	09/50	0.05/1.00	10	0.98	1.4	2.00
CFQ26W/G24Q	1	26	50/10	0.25	08/29	0.05/1.00	14	0.95	1.4	3.45

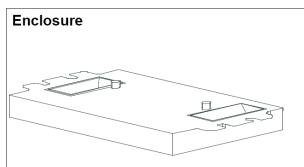


Green Terminal must be Grounded

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

Standard Lead Length (inches)

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



Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
4.98 "	3.00 "	1.29 "	2.00 "
4 49/50	3	1 29/100	2
12.6 cm	7.6 cm	3.3 cm	5.1 cm

Revised 06/18/2003



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

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

Fixture Type C4

DESCRIPTION

The Zuma 1201 series is a rugged ADA-compliant recessed mounted step light for use with a low voltage, T4 halogen lamp (provided). The housing and face plate are die-oast from corrosion-resistant silicone aluminum alloy. Model 1201-LA includes a louvered face plate; model 1201-OA features an open face plate. Both can be mounted in non-combustible surfaces such as brick, concrete or stone.

SPECIFICATION FEATURES

A ... Material

Face plate and recessed mounted housing are corrosion-resistant die-cast silicone eluminum. Housing includes two 1/2" NPS threaded holes for easy through wiring.

B ... Finish

Fixtures are double protected by a chromate conversion undercoating and polyester powderooat paint finish, surpassing the rigorous demands of the outdoor environment. A variety of standard colors are available.

C ... Reflector

Specular pebblestone aluminum reflector is standard to provide high lumen output and even illumination

D ... Gasket Housing and face plate are sealed with a high temperature silicone o ring gesket to prevent water intrusion.

E ... Lens

Diffused tempered glass lens, factory sealed with high temperature adhesive to prevent water intrusion and breakage due to thermal shock.

F ... Hardware Stainless steel hardware is standard to provide maximum corrosion-resistance.

G ... Socket Ceramic pooket with 260° C Teflon® coated lead wires and GY6.36 bi-pin base.

H ... Electrical

Catalog #

Project

Com nta repared by

Remote 12V transformer required (not included). Available from Lumière as an accessory - see the Accessories & Technical Data section of this catalog for details.

L., Lamp

Included as standard. Optional diode connection reduces voltage to the lamp and extends lamp life up to 12,000 hours (specify option -CL).

J ... Labels & Approvals UL and oUL listed, standard wet label. Manufactured to ISO 9001-2000 Quality Systems Standard. IBEW union made.



ZUMA 1201-LA 1201-OA

35W (max.) T4 Halogen Low Voltage

Step Light

ADA-COMPLIANT

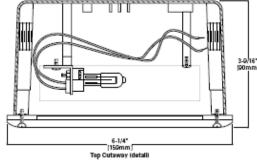




1201-0A Open Face Plate

1201-LA (Louvered Face Plate)







Specifications and Dimensions subject to change without notice.

ADL082510

LUMIÈRE[®]

Lamp Type C4



20T4Q/CL/AX 12V

Order 201 Abbreviation:

General Tungs Description: 12Volt

Tungsten Halogen Quartz Bi-Pin STARLITE Low Pressure Clear Finish UV-Stop With Axial Filament GY6.35 Bi-Pin Base 20Watt 12Volt 4000Hr Lamp Life

>

	Product Information
Abbrev. With Packaging Info.	20T4QCLAX 12V 40/CS 1/SKU
Approx. Lumens	320
Average Rated Life (hr)	4000
Base	GY6.35 Bipin
Bulb	T4
Class	C (gas)
Color Rendering Index (CRI)	100
Color Temperature/CCT (K)	3000
Diameter (in)	0.5
Diameter (mm)	12.7
Ecologic	YES
Family Brand Name	STARLITE® Bi-Pin
Filament	AXIAL
Lamp Finish	Clear
Light Center Length - LCL (in)	1.125
Light Center Length - LCL (mm)	28.575
Maximum Overall Length - MOL (in)	1.750
Maximum Overall Length - MOL (mm)	44.45
Nominal Voltage (V)	12.00
Nominal Wattage (W)	20.00

Fixture Type C5

iolighting.com







<u>C5</u>

luxrail



Hand Rail Size Options



Power Supply (Driver) Information

Standard Light Output

TYPE	SUPPLIES	REMOTE DISTANCE
24v20w	UP TO 78"	32'-0" (w/18awg)
24v100w	UP TO 35'-0"	18'-0" (w/18awg)
	(2) runs up to 49' with (1) run NTE 35'-0"	46'-0" (w/14 <i>a</i> wg) 71'-0" (w/12 <i>a</i> wg)

High Output

TYPE	SUPPLIES	REMOTE DISTANCE
24v100w	UP TO 12'-0"	18'-0" (w/18awg)
		46'-0" (w/14awg)
		71'-0" (w/12awg)

Application ANSI and ADA compliant luxrail, is an indoor/outdoor handrail that delivers functional illumination. Two intensities may be specified; "standard light output" & "high output". The standard lightoutput version delivers illuminance levels appropriate for exterior applications (3 to 4 footcandles at grade) as well as dark interior environments with low ambient illumination levels, (i.e. theater, thermed environments). The bidh auttrut version (i.e. theatres, themed environments). The high output version delivers illuminance levels applicable to interior environments providing in excess of 10 footcandles along the path of egress (ANSI required). Independent photometric test reports and IES Format data are available upon request from io Lighting.

luxrail's standard handrail gripping surfaces are circular in cross section and meet ADAAG (Americans with Disability Act Accessibility Guidelines). Beam spread options include 10, 45, and 65 degrees. The 45 and 65 degree beam patterns are most suitable for illuminating pathways while the 10 degree beam spread offers accent lighting to optional glass or stainless steel cable railing infills. Reference page 8 for information regarding infill options. LED lumen depreciation at 50,000 hrs. is 30%.

Light Output

luxrail is available with two luminous intensities:

Standard:

- · Warm White: 38 Ims/ft
- · Cool White: 48 Ims/ft

High Output:

- · Warm White: 127 Ims/ft
- · Cool White: 145 Ims/ft

Construction

luxrail is available in stainless steel, aluminum or brass. luxrail may be post mounted or wall mounted. Mounting hardware (post or wall) is required up to 5' or 6' O.C., depending on the handrail alloy. The lighting fixture component of the luxrail is a stand alone unit and is available in incremental nominal lengths that range from 6" to 60". Vandal resistant access chamber allows units to be removed for maintenance purposes.

The light fixture's housing is made of a light weight, yet durable aluminum, providing the recommended heat sink requirements for the LEDs. Housing, optical assembly and stainless steel end caps are bonded to prevent water infiltration.

Electrical

Invarial houses a low voltage LED based light fixture which is integrated into the underside of the handrail. It comes complete with the linear light fixture installed in the handrail and required power supplies (aka "drivers"). Electrical "daisy chain" connections must be made on site. 120 or 277 volt drivers are available. The drivers must be remotely located. Refer to Driver Chart (shown on left) for additional information.

Power Consumption

· standard: 2 w/ft

· high output: 8 w/ft

Finish

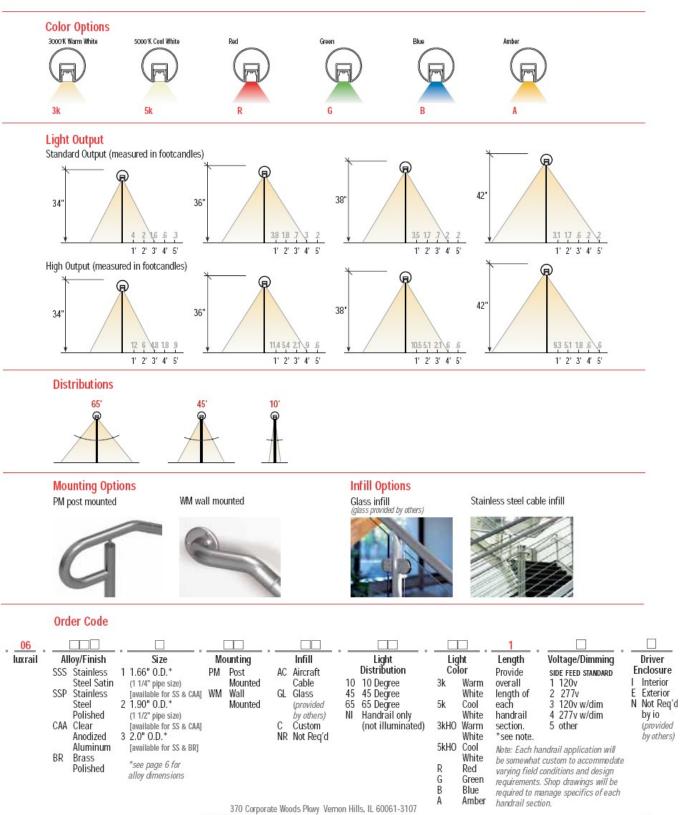
luxrail is available in a variety of finishes: polished or brushed stainless steel (satin finish with brush grain along the longitudinal axis), clear anodized aluminum and polished brass. Custom finishes may be available upon request.

370 Corporate Woods Pkwy Vernon Hills, IL 60061-3107

T 847.735.7000 F 847.735.7001 E info@iolighting.com W iolighting.com

luxrail





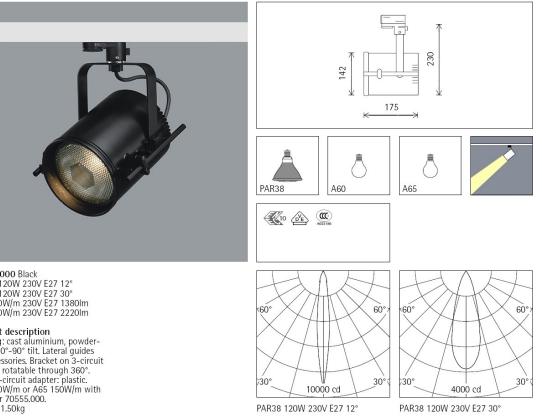
T 847.735.7000 F 847.735.7001 E info@iolighting.com W iolighting.com

0

io



Fixture Type C6 TM Spotlight for PAR lamps and general service lamps



77460.000 Black PAR38 120W 230V E27 12° PAR38 120W 230V E27 30° A60 100W/m 230V E27 1380Im A65 150W/m 230V E27 2220Im

Product description Housing: cast aluminium, powder-coated. 0°-90° tilt. Lateral guides for accessories. Bracket on 3-circuit adapter rotatable through 360°. ERCO 3-circuit adapter: plastic. A60 100W/m or A65 150W/m with reflector 70555.000. Weight 1.50kg

h(m)	E(Ix)	D(m)
		12°
1	9300	0.21
2	2325	0.42
3	1033	0.63
4	581	0.84
5	372	1.05

PAR38	120W	230V E27 3
h(m)	E(Ix)	D(m) 30°
1 2 3 4	3100 775 344 194	0.54 1.07 1.61 2.14
5	124	2.68



Mounting ERCO 3-circuit track Hi-trac 3-circuit track Monopoll 3-circuit track 1-circuit singlet

ERCO Leuchten GmbH Postfach 2460 58505 Lüdenscheid Germany Tel.: +49 2351 551 0 Fax: +49 2351 551 300 info@erco.com

Technical Region: 230V/50Hz Edition: 16.11.2006 Please download the current version from www.erco.com/77460.000

ERCO

TM Spotlight

Cleaning Ambient LMF RSMF	g (a) t conditions	1 P 0.98 0.99	C 0.94 0.98	N 0.90 0.96	D 0.86 0.95	2 P 0.95 0.97	C 0.91 0.96	N 0.86 0.95	D 0.81 0.94	3 P 0.94 0.97	C 0.90 0.96	N 0.84 0.95	D 0.79 0.94
Hours of LLMF LSF	f operation (h)	1000 0.93 1											
MF LMF RSMF LLMF LSF P C N	LMFxRSMFxLLM Maintainance F Lumiaire Maint Room Surface I Lamp Lumens N Lamp Survival F Room pure Room clean Room normal Room dirty	actor enance Mainten Mainten	ance F										

Lamp Type C6



Product Number: 14848

Order Abbreviation: 120PAR38/HAL/NFL25 120V

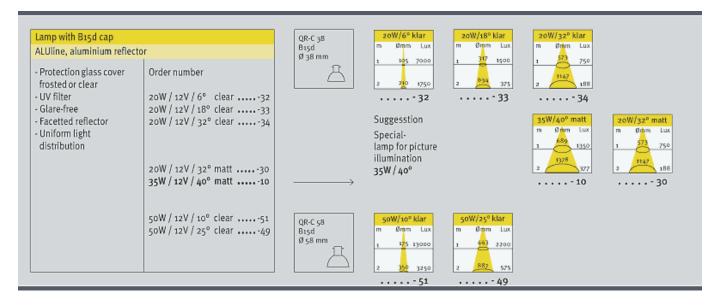
General Description: Tungsten Halogen CAPSYLITE PAR38 Reflector Lamp Medium Skirt Base 120Watt 120Volt Narrow Flood Beam

.

	Product Information
Abbrev. With Packaging Info.	120PAR38HALNFL25 120V 15/CS 1/SKU
Approx. Lumens	1800
Average Rated Life (hr)	3000
Base	E26 Medium Skirted
Beam Angle (deg)	25
Beam Type	NFL
Bulb	PAR38
Centerbeam Candlepower (cp)	7700
Class	C (gas)
Color Rendering Index (CRI)	100
Color Temperature/CCT (K)	2950
Diameter (in)	4.75
Diameter (mm)	120.65
Ecologic	YES
Family Brand Name	CAPSYLITE® PAR38 SPL
Filament	CC-8
Horizontal Beam Angle (deg)	25
Maximum Overall Length - MOL (in)	5.3125
Maximum Overall Length - MOL (mm)	134.9375
Nominal Voltage (V)	120.00



Fixture Type C7



Lamp Type C7

20833 - Q50MR16/C/FL40 GE ConstantColor® Precise™ MR16

GENERAL	CHARACTERISTICS
ULNEINAL	CHANACTERISTICS

	-
Lamp type	Halogen - MR
Bulb	MR16
Base	2-Pin (GX5.3)
Filament	C-6
Wattage	50
Voltage	12
Voltage (MIN)	50
Rated Life	6000 hrs
Rated Life (Vert)	6000 hrs
Lamp Enclosure Type (LET)	Open or enclosed fixtures



🔍 View Larger

PHOTOMETRIC CHARACTERISTICS

1700
1700
1700
1700
3050 K
34

DIMENSIONS

Maximum Overall Length (MOL)	1.8750 in (47.6 mm)
Bulb Diameter (DIA)	2.000 in (50.8 mm)

PRODUCT INFORMATION

Product Code	20833
Description	Q50MR16/C/FL40
ANSI Code	EXN
Standard Package	BUNDLE
Standard Package GTIN	00043168208338
Standard Package Quantity	20
Sales Unit	Unit
No Of Items Per Sales Unit	1
No Of Items Per Standard Package	20
UPC	043168994262

Testimonials Testimonials Brochures Application/Segment Brochures • Beauty Salon Lighting • Contractor Lighting • Healthcare Lighting • Office Lighting • Specialty Store Lighting • Product Brochures • Color

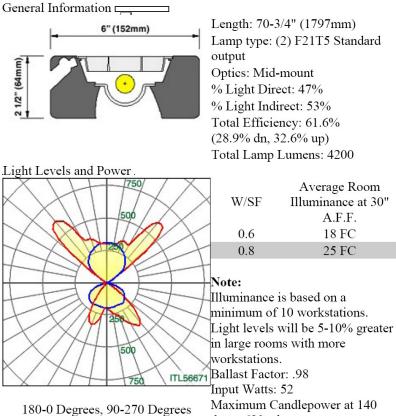
ADDITIONAL RESOURCES

Catalogs

- <u>Color</u>
 <u>XL Brochure</u>
- Sell Sheets
- GE ConstantColor® Precise™ MR16 Lamps IES/Photometric Download

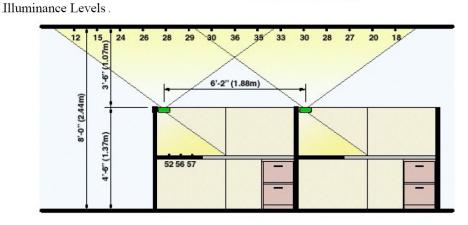
MSDS (Material Safety Data Sheets) Disposal Policies & Recycling Information

Fixture Type F1



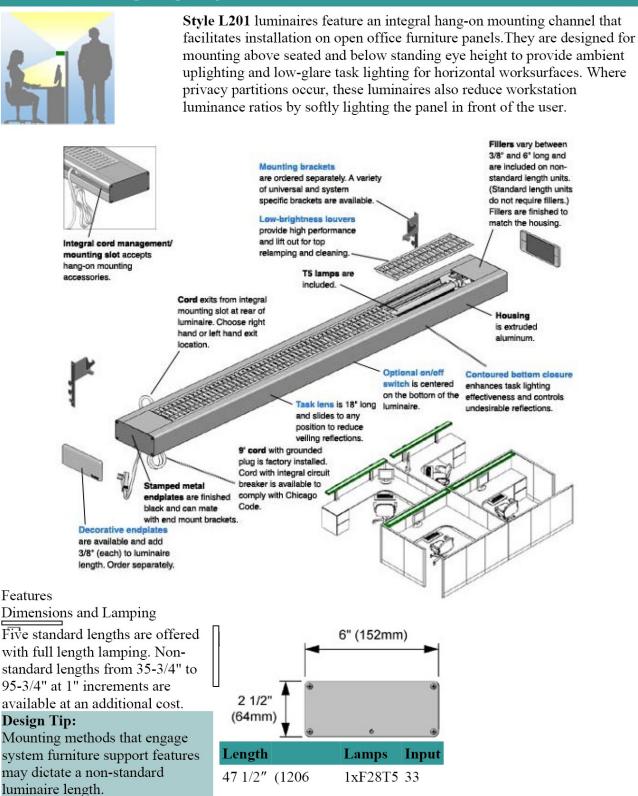
deg = 629 cd

Download IES file



Task Ambient Lighting - Style L201

Click to prin



Each luminaire is provided with one T5 fluorescent lamp or two	59″
tandem mounted T5 lamps	
according to the overall luminaire	70-3/4″
length. To limit the luminance of	
workstation surfaces, only	
standard output lamps are offered.	82 1/2"
The use of high-output T5 lamps is	
not recommended.	

mm) watts 41 (1499mm) 1xF35T5 watts 49 ' (1797mm) 2xF21T5 watts 1xF21T5 60 (2096 mm) +watts 1xF28T5 66 94 1/4" (2394mm) 2xF28T5 watts

3000K lamps are included. 3500K and 4100K lamps are available upon request.

Non-standard lamp configurations are available on large quantity orders (e.g. 71" luminaire with 1xF35T5 lamp). Consult factory.

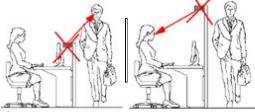
Mounting Height

Three optical configurations are available to accommodate 24" and 30" deep worksurfaces and mounting heights between 48" and 66".

Design Tip:

Mounting positions above 66" generally warrant the use of separate task and ambient lighting systems.

24" De Worksur	-	30″ Deep Worksurfaces		
Mounting Height	Optics	Mounting Height	Optics	
<u>≥</u> 48″ <u>≤</u> 50″	Low- mount	<u>≥</u> 48″ <u>≤</u> 52″	Low- mount	
>50" <u><</u> 57"	Mid- mount	>52" <u><</u> 61"	Mid- mount	
>57‴ <u><</u> 62″	High - mount	>61" ≤ 66"	High - mount	



Caution: To avoid discomfort glare, do not install these units below 48" A.F.F. or above 66" A.F.F. (62" for 24" deep worksurfaces). Note: These guidelines are based on a worksurface height of 28-1/2'' and a minimum seated eye height of 40-1/2''.





Caution: Panels that extend beyond the top of luminaire will restrict the uplight distribution and introduce undesirable panel brightness. Panel must not extend more than 1" above the top of the luminaire.

Mounting Accessories

Hang-on panel clamps are available for mounting workstation luminaires on partitions from 1-1/2" to 3-1/2" thick. Order panel clamps separately.

Desk clamp stanchions are available for mounting to worksurfaces from 1" to 2" thick. Order desk clamp stanchions separately.

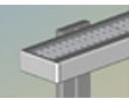
Style L201 luminaires are also compatible with **bridge mount stanchions** and **wall and panel mounting brackets**. See Accessories. **Design Tip:** For dedicated bridge and end mounted installations, consider Style L202 workstation luminaires with two smooth sides. (No rear mounting slot.)



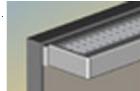
Panel clamp



Wall mount



Desk clamp stanchion



Panel mount

Tambient can supply mounting brackets for use with specific commercial office furniture systems and custom brackets for unique mounting conditions. Contact Tambient for details.

Ballasts

Danasts	
Luminaires are supplied with integral 120 volt, high	Total Harmonic Distortion (THD) < 10%
power factor electronic ballasts for energy efficiency. Programmed start ballasts are standard to maximize lamp life and minimize energy use. Manufacturer/model of furnished ballast(s) may	Power Factor (PF) > 97%Ballast Factor* (BF) > 98%
Programmed start ballasts	Current Crest Factor (CF) < 1.7
are standard to maximize amp life and minimize	Sound Rating A or better
energy use.	ANSI, IEEE, and FCC compliant
Manufacturer/model of furnished ballast(s) may vary. However, all ballasts	■UL listed (United States and Canada)
furnished meet or exceed the following criteria:	*Primary lamp application
Cords	

Cords are factory installed, 18 gauge, 3-conductor, Type SJT with grounded plug in accordance with UL153 (*Standard for Portable Electric Luminaires*) and the associated *Supplementary Requirements for Units for Use with Office Furnishings*.

Furnished cord length is 9 feet; the maximum length allowed by code. Standard cords are black. Gray and beige cords are available at an additional cost.

For installations in the City of Chicago, we offer cords with a circuit breaker in the plug to comply with the Chicago Electric Code. Chicago cords are offered in straight plug A choice of straight and sw rotation plugs is offered.



The **sw rotation plug** allows two low-profile plugs to engage adjacent outlets in one duplex receptacle while managing cords close to walls and office partitions.

Straight plugs are often best for use with power outlets in recessed floor boxes and access flooring systems.



All cord plugs are NEMA 5-15 configuration and require a compatible grounded electrical receptacle (by others).

Cord Exit Locations

Cord exits are concealed in a unique multi-purpose mounting slot at the rear of the luminaire. The slot contains cord management features allowing the cord to be routed horizontally (right or left) to any drop location, even when mounting accessories are inserted into the slot.



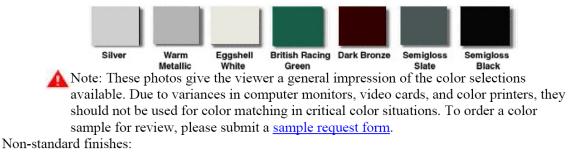
Left hand cord exit

Right hand cord exit

Finishes

6-stage pretreatment and electrostatically applied thermoset powder coat provides a stable, long-lasting and corrosion resistant finish.

Standard finishes:



RAL color finishes are available for a set up charge of \$300 per run. RAL finishes are Tiger Drylac®

Series 49 formulations and have a smooth glossy finish. <u>Contact your nearest Tiger Drylac® office</u> to obtain color samples. For non-RAL colors and other gloss factors specify a custom color finish. <u>Preview</u> <u>RAL colors</u>

Custom color finishes are available for a set up charge of \$750 per run. You must submit a color sample for Tambient to consider your custom color request.

Decorative Endplates

Decorative endplates are available and must be ordered separately. They install easily over the standard black endplates with a single concealed screw to form a decorative reveal. Decorative endplates add 3/8" (each) to the luminaire length.



Note: Luminaires with decorative endplates cannot be end-mounted. Decorative endplates can be removed to allow for end mounting if luminaire length corresponds to mounting location.

Safety Standards

All Tambient luminaires are UL listed to comply with United States and Canadian standards.



Lamp Type F1



Ballast Type F1



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

Electrical Specifications

Lamp Type	Num. of Lamp s	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	0.16	19	1.07	20	0.98	1.7	5.63
F14T5	2	14	0/-18	0.29	34	1.06	10	0.98	1.7	3.12
F21T5	1	21	0/-18	0.21	26	1.03	15	0.99	1.7	3.96
F21T5	2	21	0/-18	0.40	48	1.02	10	0.98	1.7	2.13
F28T5	1	28	0/-18	0.28	33	1.04	10	0.98	1.7	3.15
F28T5	2	28	0/-18	0.55	64	1.03	10	0.99	1.7	1.61
F35T5	1	35	0/-18	0.34	41	1.01	10	0.98	1.7	2.46
* F35T5	2	35	0/-18	0.67	80	1.00	10	0.99	1.7	1.25

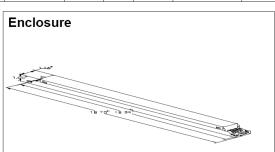
Wiring Diagram



The wiring diagram that appears above is for the lamp type denoted by the asterisk $(\ensuremath{^*})$

Standard Lead Length (inches)

Black White	in. 0	cm. 0	-		in.	cm.
	0	0				
White			Ļ	Yellow/Blue	0	0
	0	0		Blue/White	0	0
Blue	0	0		Brown	0	0
Red	0	0		Orange	0	0
rellow	0	0		Orange/Black	0	0
Gray	0	0		Black/White	0	0
Violet	0	0		Red/White	0	0
	Red /ellow Gray	Red0/ellow0Gray0	Red 0 0 (ellow 0 0 Gray 0 0	Red 0 0 (ellow 0 0 Gray 0 0	Blue 0 0 Red 0 0 /ellow 0 0 Gray 0 0 Black/White 0 0	Blue 0 0 Red 0 0 /ellow 0 0 Gray 0 0 Black/White 0



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 08/21/2006

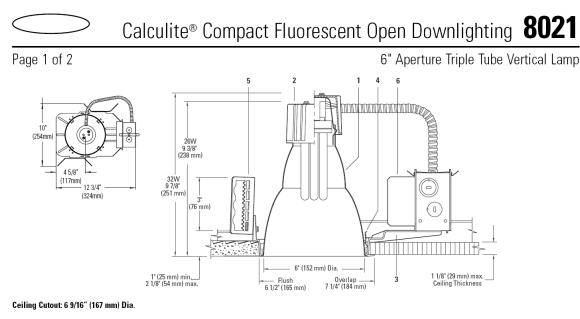


Data is based upon tests performed by Advance Transformer in a controlled environment and representative of relative performance. Actual performance can vary depending on operating conditions. Specifications are subject to change without notice. All specifications are nominal unless otherwise noted.

ADVANCE

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

Fixture Type F2



Reflector Trim		Frame-In K	Frame-In Kit			
8021 CCLP Comfort	Comfort Clear™, White Flange Comfort Clear™, Polished Flange Comfort Clear™, Molded Trim Ring		Electronic Universal Dimming Advance Mark7	120V - 277V 120V - 277V 120V - 277V	26 or 32W Triple Tube 4-Pin (Amalgam)	
8021 Add suffix. See options for other finishes.		Remodeler	Frame-In Kit		Lamp	
		6132BURM	Electronic	120V - 277V	26 or 32W Triple Tube 4-Pin (Amalgam)	

Features

- 1. Reflector: 16 ga. Alzak® aluminum, 50° visual cutoff to lamp and lamp image, medium distribution. Comfort Clear™ low iridescence finish. Self-flanged or flangeless with molded white trim ring (field paintable).
- 2. Socket Cup: Effectively dissipates heat and positions lamp holder. Snaps onto reflector neck to assure consistently correct optical alignment without tools.
- 3. Mounting Frame: Galvanized steel for dry or plaster ceilings. Accepts other 6" Triple Tube reflectors (see S6132BU Spec Sheet).
- 4. Retaining Springs: Precision-tooled steel friction springs secure reflector to mounting frame for quick, tool-less installation.
- 5. Mounting Brackets: 16 ga. steel. Adjust from inside of fixture. Use 3/4" or 1 1/2" lathing channel, 1/2" EMT, or optional mounting bars.
- 6. Ballast/J-Box: Electronic 120V-277V. UL listed for through branch circuit wiring with max of (8) No. 12 AWG, 90°c supply conductors. Outboard mounted to reduce heat transfer and maintain lamp efficacy and life. Service from below without tools.

Electrical

Note: For ballast electrical data and latest lamp/ballast compatibility refer to "Ballast" specification sheet for complete electrical data. S6132BU, S6132BCU: UL listed for through branch circuit wiring with max

of (8) No. 12 AWG, 90° C supply conductors. 6132BURM: UL listed for No. 12 AWG, 90° C supply conductors.

Options and Accessories

Comfort Clear™ Finisl	ies ¹		Other F	inishes
Diffuse	CCD		White	WH
Champagne Bronze	CCZ			
Pewter	CPW			
1Specify desired flange	W/White	D Polishod	Blank - M	oldod Pina

Specify desired flange. W White, P Polished, Blank - Molded Ring

Other Dimming:

S6132BJ1MX Advance MarkX, 120V S6132BJ1LD3 Lutron Hi-lume®, 120V S6132BJ2MX Advance MarkX, 227V S6132BJ2LD3 Lutron Hi-lume®, 227V **Options and Accessories (continued)**

Emergency Ltg. Kit	FA EM3E*
	FA EM4*
Fuse (Slow Blow)	Add suffix F
Existing/Thk. Ceiling	FA EC6*
Emergency	Add suffix EM*
Chicago Plenum	Use 6132BULC
*See Spec. Sheets: FAE	M, FAEC
Mounting Bars & Acces	sories; see Specification Sheet MBA.
Sloped Ceiling Adapters	; see Specification Sheet SCA.
IC Frame available; see	C6CFL32 Specification Sheet.

Labels

UL Listed for damp locations.

Alzak® is a registered trademark of ALCOA US Patent Pending.

Job Information Job Name: Cat. No.: Lamp(s): Notes:

Lightolier a Genlyte company

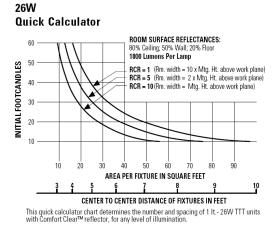
www.lightolier.com 631 Airport Road, Fall River, MA 02720 • (508) 679-8131 • Fax (508) 674-4710 We reserve the right to change details of design, materials and finish. © 2006 Genlyte Group LLC • E0406

Type:



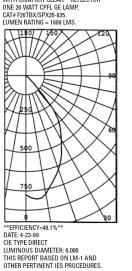
Calculite® Compact Fluorescent Open Downlighting 8021

Page 2 of 2



Spacing Ratio = 1.0

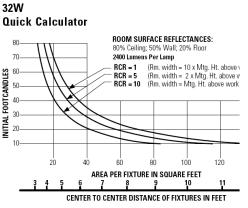
REPORT NO: LSI 14025 LIGHTOLIER RECESSED FLUORESCENT LUMINAIRE, WITH COMFORT CLEAR™ REFLECTOR



	_ SUMI		
	E CP LU	MENS	
0	775		
5	806	77	
10	780		
15	708	199	
20	646		
25	566	258	
30	478		
35	402	245	
40	285		
45	78	81	
50	13		
55	4	4	
60	2		
65	1	2	
70	1		
75	1	1	
80	0		
85	0	0	
			RCENTAGES
			LUMINAIRE
0-30	533	29.66	61.66
0-40	778	43.25	89.92
0-60	863	47.98	99.75
0-90	865	48.10	100.00
40-90	87	4.85	10.08
60-90	2	.12	.25
90-180	0	.00	.00
0-180	865	48.10	100.00

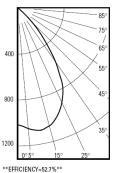
Coefficients of Utilization

EFFECTIVE FLOOR CAVITY REFLECTANCE = .20							
	80	70	50	30	10		
		WAL	L OF REFLEC	TANCE			
	50 30 10	50 30 10	50 30 10	50 30 10	50 30 10	0	
1	.54 .53 .52	.53 .52 .51	.51 .50 .49	.49 .48 .48	.47 .47 .46	.46	
2	.50 .49 .47	.50 .48 .47	.48 .47 .46	.47 .46 .45	.45 .45 .44	.43	
3 4 5 6 7 8 9	.47 .45 .44	.47 .45 .43	.46 .44 .43	.44 .43 .42	.43 .42 .41	.41	
₩ 4	.45 .42 .40	.44 .42 .40	.43 .41 .40	.42 .41 .39	.41 .40 .39	.38	
≧ 5	.42 .39 .37	.42 .39 .37	.41 .39 .37	.40 .38 .37	.39 .38 .36	.36	
₹ 6	.40 .37 .35	.39 .37 .35	.39 .36 .35	.38 .36 .34	.37 .36 .34	.34	
27	.37 .34 .33	.37 .34 .32	.36 .34 .32	.36 .34 .32	.35 .33 .32	.31	
Ø 8	.35 .32 .30	.34 .32 .30	.34 .32 .30	.34 .31 .30	.33 .31 .30	.29	
8 9	.33 .30 .28	.32 .30 .28	.32 .30 .28	.32 .29 .28	.31 .29 .28	.27	
10	.31 .28 .26	.30 .28 .26	.30 .28 .26	.30 .27 .26	.29 .27 .26	.25	



This quick calculator chart determines the number and spacing of 1 lt.- 32W TTT un with Comfort Clear™ reflector, for any level of illumination

Spacing Ratio = 1.1



DATE: 4-27-99 CIE TYPE DIRECT LUMINOUS DIAMETER: 6.000 THIS REPORT BASED ON LM-1 AND OTHER PERTINENT IES PROCEDURES.

0 1035 ZONAL LUMENS & ND PECENTAGES ZONE LUMENS % LAMP % LUMINAIRE 0-30 821 34.2 64.9 0-40 1175 49.0 92.9 0-60 1265 52.7 100.0 0-90 9 0 3.8 7.1 60-90 5 0.2 0.4 90-120 0 0.0 0.0 90-180 0 0.0 0.0 90-180 1265 52.7 100.0 0.0 52.7 0-180 1265

100.0

Coefficients of Utilization

	EFFE	CTIVE FLOOI	R CAVITY RE	FLECTANCE =	.20	
	80	70	50	30	10	
	50 30 10		L OF REFLEC 50 30 10	TANCE 50 30 10	50 30 10	0
1	.59 .58 .57	.58 .57 .56	.56 .55 .54	.54 .53 .53	.52 .52 .51	.50
2	.56 .54 .53	.55 .54 .52	.54 .52 .51	.52 .51 .50	.51 .50 .49	.48
<u> </u>	.53 .51 .50	.53 .51 .49	.51 .50 .49	.50 .49 .48	.49 .48 .47	.46
ROOM CAVITY RATIO	.51 .48 .47	.50 .48 .46	.49 .47 .46	.48 .46 .45	.47 .46 .45	.44
≥ 5	.48 .46 .44	.48 .45 .44	.47 .45 .43	.46 .44 .43	.45 .44 .43	.42
₩ 6	.46 .43 .42	.46 .43 .41	.45 .43 .41	.44 .42 .41	.44 .42 .41	.40
27	.44 .41 .39	.43 .41 .39	.43 .41 .39	.42 .40 .39	.42 .40 .39	.38
58	.41 .39 .37	.41 .39 .37	.41 .38 .37	.40 .38 .37	.40 .38 .36	.36
8 9	.39 .36 .35	.39 .36 .35	.38 .36 .35	.38 .36 .34	.38 .36 .34	.34
10	.35 .32 .31	.35 .32 .31	.35 .32 .30	.34 .32 .30	.34 .32 .30	.30
	ob Info	rmati	on	Type		

Lightolier a Genlyte company

www.lightolier.com 631 Airport Road, Fall River, MA 02720 • (508) 679-8131 • Fax (508) 674-4710 We reserve the right to change details of design, materials and finish. © 2006 Genlyte Group LLC • C0406

6" Aperture Triple Tube Vertical Lamp

Lamp Type F2



Product Number: 20881

Order CF26DT/E/IN/835/ECO Abbreviation:

General Description:

DULUX 26W triple compact fluorescent amalgam lamp with 4-pin base, integral EOL, 3500K color temperature, 82 CRI, for use with electronic and dimming ballasts, ECOLOGIC

Product Information							
CF26DTEIN835ECO 50/CS 1/SKU							
12000							
GX24Q-3							
T (T4)							
82							
3500							
Dulux® T/E							
IEC 60901- 3426							
1746							
1501							
5.0							
126							
CFTR26W/GX24Q/835							
CFM26W/GX24Q/835							
26.00							

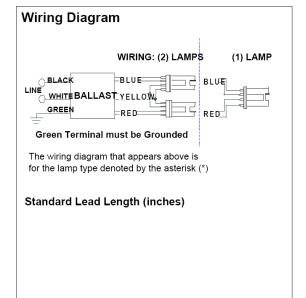
Ballast Type F2

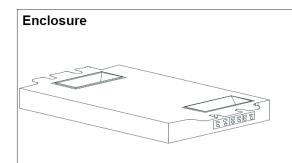


Electrical Specifications

ICF2S42900	CM2LD@120
Brand Name	SMARTMATE
Ballast Type	Electronic
Starting Method	Programmed Start
Lamp Connection	Parallel
Input Voltage	120
Input Frequency	50/60 HZ
Status	Active

	Lamp Type	Num. of Lamp s	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.
×	CFM26W/GX24Q	1	26	0/-18	0.25	29	1.10	10	0.98	1.5	3.79
	CFM26W/GX24Q	2	26	0/-18	0.46	55	1.00	10	0.98	1.5	1.82





Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
4.98 "	3.00 "	1.29 "	4.60 "
4 49/50	3	1 29/100	4 3/5
12.6 cm	7.6 cm	3.3 cm	11.7 cm



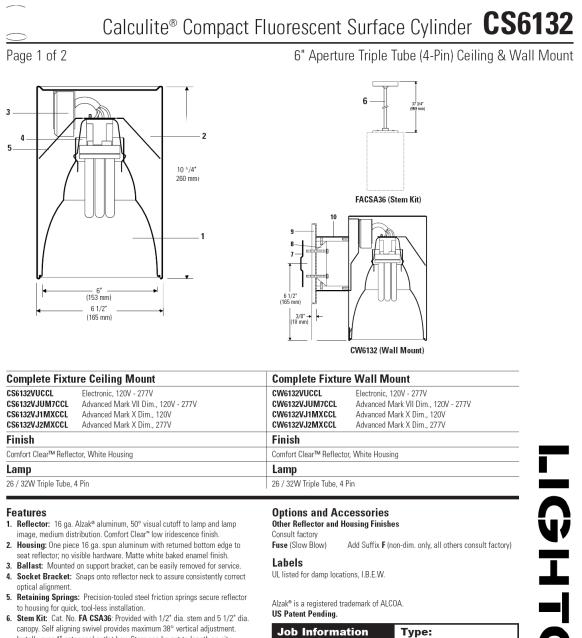
Revised 08/21/2006

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 notec

ADVANCE

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

Fixture Type F3



- Installs over 4" octagonal outlet box. Stem can be cut to length on site. Matte white baked enamel finish. 7. Crossbar: Installs over 3" or 4" octagonal or rectangular outlet box.
- 8. Cleat: Cast aluminum; allows mounting to mullion or post without
- backplate
- 9. Backplate: Die-cast aluminum; 6 1/4" high by 4" wide; matte white. 10. Bracket: Extruded aluminum: matte white finish. Secured to cleat by set screws

Electrical

Note: For ballast electrical data and latest lamp/ballast compatibility refer to "Ballast" specification sheet for complete electrical data.

UL listed for 90°C supply conductors.

Job Information Job Name:

Cat. No.:

Lamp(s):

Notes:

Lightolier a Genlyte Thomas Company

www.lightolier.com 631 Airport Road, Fall River, MA 02720 • (508) 679-8131 • Fax (508) 674-4710 We reserve the right to change details of design, materials and finish. © 2004 Genlyte Thomas Group LLC (Lightolier Division) • C0704

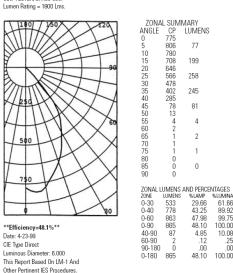


Calculite® Compact Fluorescent Surface Cylinder CS6132

Page 2 of 2

26W

Spacing Ratio = 1.0 Report No: LSI 14025 Lightolier Recessed Fluoresco One 26 Watt CPFL GE Lamp, rescent Luminaire, With Comfort Clear™ Reflector Cat# F26TBX/SPX35-835.



6" Aperture Triple Tube (4-Pin) Ceiling & Wall Mount

ZONAL SUMMARY

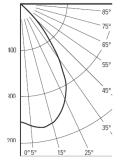
0 0

0000

AUSUMMARY AVG* ZONAL C.P. LUMENS 0 0 0 0

32W

Spacing Ratio = 1.1 Report Prepared For: Lightolier 04-27-1999 Report No: LRL 499-9G Lamps: 1 PLT-32 Lumens: 2400 Descrip.: 6" Dia X 10" Ht Recessed Downlight With Comfort Clear™ Reflector. Vertical Lamp.



Efficiency=52.7% Date: 4-27-99 CIE Type Direct Luminous Diameter: 6.000 This Report Based On LM-1 And Other Pertinent IES Procedures.

611MINAIR 61.66 89.92 99.75 100.00 10.08

.25 .00 100.00

105 95 90 85 75 65 55 45 35 25	0 0 1 3 99 563 904	0 0 1 3 8 77 354 418	
15 5	1063 1066	301 102	
0 70NAL	1035	ND PERCE	NTACES
ZONE	LUMENS	% LAMP	%LUMINAIRE
0-30	821	34.2	64.9
0-40 0-60	1175 1260	49.0 52.5	92.9 99.6
0-90	1265	52.7	100.0
40-90	90	3.8	7.1
60-90 90-120	5	0.2	0.4 0.0
90-120		0.0 0.0	0.0
90-180	ŏ	0.0	0.0
0–180	1265	52.7	100.0

Coefficients of Utilization

Effective Floor Cavity Reflectance = .20								
		80	70	50	30	10		
			V	Vall Reflecta	nce			
		50 30 10	50 30 10	50 30 10	50 30 10	50 30 10	0	
	1	.59 .58 .57	.58 .57 .56	.56 .55 .54	.54 .53 .53	.52 .52 .51	.50	
	2	.56 .54 .53	.55 .54 .52	.54 .52 .51	.52 .51 .50	.51 .50 .49	.48	
Ę.	3	.53 .51 .50	.53 .51 .49	.51 .50 .49	.50 .49 .48	.49 .48 .47	.46	
Ba.	4	.51 .48 .47	.50 .48 .46	.49 .47 .46	.48 .46 .45	.47 .46 .45	.44	
Ϊţ	5	.48 .46 .44	.48 .45 .44	.47 .45 .43	.46 .44 .43	.45 .44 .43	.42	
Cav	6	.46 .43 .42	.46 .43 .41	.45 .43 .41	.44 .42 .41	.44 .42 .41	.40	
Room Cavity Ratio	7	.44 .41 .39	.43 .41 .39	.43 .41 .39	.42 .40 .39	.42 .40 .39	.38	
Boc	8	.41 .39 .37	.41 .39 .37	.41 .38 .37	.40 .38 .37	.40 .38 .36	.36	
_	9	.39 .36 .35	.39 .36 .35	.38 .36 .35	.38 .36 .34	.38 .36 .34	.34	
	10	.35 .32 .31	.35 .32 .31	.35 .32 .30	.34 .32 .30	.34 .32 .30	.30	

IGHTOLIE

Job Information

Type:

Lightolier a Genlyte Thomas Company www.lightolier.com G31 Airport Road, Fall River, MA 02720 • (508) 679-8131 • Fax (508) 674-4710
 We reserve the right to change details of design, materials and finish.
 © 2004 Genlyte Thomas Group LLC (Lightolier Division) • C0704

Coefficients of Utilization

Effective Floor Cavity Reflectance = .20

			80			70			50			30			10		
							V	Vall	Refl	ecta	nce						
		50	30	10	50	30	10	50	30	10	50	30	10	50	30	10	0
	1	.54	.53	.52	53	.52	.51	.51	.50	.49	.49	.48	.48	47	.47	.46	.46
	2	.50	.49	.47	50	.48	.47	.48	.47	.46	.47	.46	.45	45	.45	.44	.43
Ę.	3	.47	.45	.44	47	.45	.43	.46	.44	.43	.44	.43	.42	43	.42	.41	.41
Ba	4	.45	.42	.40	44	.42	.40	.43	.41	.40	.42	.41	.39	41	.40	.39	.38
Ξć	5	.42	.39	.37	42	.39	.37	.41	.39	.37	.40	.38	.37	39	.38	.36	.36
G	6	.40	.37	.35	39	.37	.35	.39	.36	.35	.38	.36	.34	37	.36	.34	.34
Room Cavity Ratio	7	.37	.34	.33	37	.34	.32	.36	.34	.32	.36	.34	.32	35	.33	.32	.31
ß	8	.35	.32	.30	34	.32	.30	.34	.32	.30	.34	.31	.30	33	.31	.30	.29
	9	.33	.30	.28	32	.30	.28	.32	.30	.28	.32	.29	.28	31	.29	.28	.27
	10	.31	.28	.26	30	.28	.26	.30	.28	.26	.30	.27	.26	29	.27	.26	.25

186

Lamp Type F3



Product Number: 20881

Order CF26DT/E/IN/835/ECO Abbreviation:

General Description:

DULUX 26W triple compact fluorescent amalgam lamp with 4-pin base, integral EOL, 3500K color temperature, 82 CRI, for use with electronic and dimming ballasts, ECOLOGIC

Product Information							
Abbrev. With Packaging Info.	CF26DTEIN835ECO 50/CS 1/SKU						
Average Rated Life (hr)	12000						
Base	GX24Q-3						
Bulb	T (T4)						
Color Rendering Index (CRI)	82						
Color Temperature/CCT (K)	3500						
Family Brand Name	Dulux® T/E						
Industry Standards	IEC 60901- 3426						
Initial Lumens at 25C	1746						
Mean Lumens at 25C	1501						
Maximum Overall Length - MOL (in)	5.0						
Maximum Overall Length - MOL (mm)	126						
NEMA Generic Designation (current)	CFTR26W/GX24Q/835						
NEMA Generic Designation (old)	CFM26W/GX24Q/835						
Nominal Wattage (W)	26.00						

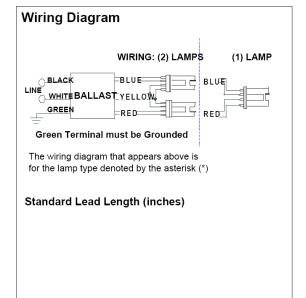
Ballast Type F3

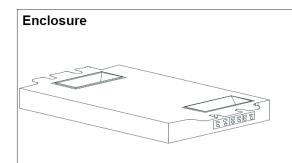


Electrical Specifications

ICF2S42900	CM2LD@120
Brand Name	SMARTMATE
Ballast Type	Electronic
Starting Method	Programmed Start
Lamp Connection	Parallel
Input Voltage	120
Input Frequency	50/60 HZ
Status	Active

	Lamp Type	Num. of Lamp s	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.
×	CFM26W/GX24Q	1	26	0/-18	0.25	29	1.10	10	0.98	1.5	3.79
	CFM26W/GX24Q	2	26	0/-18	0.46	55	1.00	10	0.98	1.5	1.82





Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
4.98 "	3.00 "	1.29 "	4.60 "
4 49/50	3	1 29/100	4 3/5
12.6 cm	7.6 cm	3.3 cm	11.7 cm



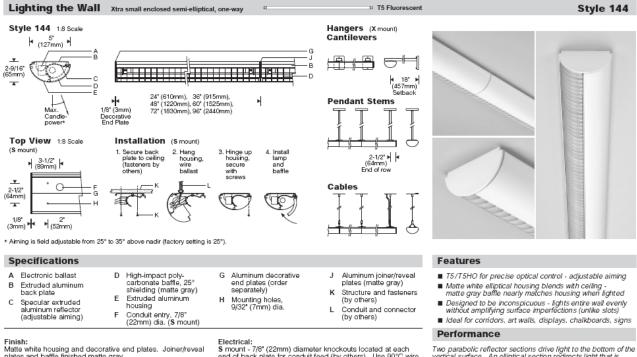
Revised 08/21/2006

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 notec

ADVANCE

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

Fixture Type F4



Finish: Matte white housing and decorative end plates. Joiner/reveal plates and baffle finished matte gray. Painted surfaces - 6 stage pretreatment and electrostatically applied thermoset powder coat for stable, long lasting and corrosion resistant finish.

Reflector - extruded high purity aluminum with clear anodized specular finish. All luminaire hardware - stainless steel.

Mounting: S mount - back plate mounts flush to ceiling.

X mount - cantilevers, stems or cables ordered separately. Cantilever - 1" x 2" steel arm, suitable support structure required. Adjustable interface plate (concealed under canopy) allows leveling of arms +/- 5°. Pendant stem - 11/16 O.D. aluminum, internally threaded.

Cable - 1/16" dia. 7x7 aircraft cable, field adjustable length. Hangers at ends of row (or single) are located 2-1/2' (64mm) from end. Intermediate hangers are centered on joint.

REV. 12/02 U.S. Patent D459012. Canadian Patent 93426

Electrical: S mount - 7/8' (22mm) diameter knockouts located at each end of back plate for conduit feed (by others). Use 90°C wire for supply connections and through wire.

X mount - electrical feed hanger mounts over recessed outlet box (by others). Cantilever and stem electrical feeds supplied with #14 AWG leads (must be located at end of row). Cable feed includes 18/3 cord (can be located at end or joint). Housing hinges down for access to ballast and wiring. Optional #14 AWG prewired modular through wiring with quick connectors.

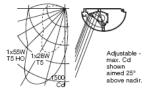
Integral electronic HPF thermally protected class P ballast with end-of-life protection.

Optional electronic dimming ballast dims to 1% of full light output. Compatible dimming control is required (by others). Consult sales representative for specifications.

Optional integral emergency battery operates one lamp. Separate unswitched supply is required.

Standard: UL listed or CSA certified.

Two parabolic reflector sections drive light to the bottom of the vertical surface. An elliptical section redirects light that is normally wasted back to a parabola. Glare is minimized and asymmetry of the beam is maximized resulting in high beam efficiency and superior surface uniformity.



For complete photometrics, visit www.elliptipar.com

elliptipar

w

16.2

To Order



1 Source

F = Linear fluorescent

2 Style

 Xtra small enclosed semi-elliptical, one-way, integral ballast 144

3 Lamp

Note: To order by overall row length, enter ROW CODE in place of Lamp Code below (see Row Charts on page 16-3a). Row Codes specify a row complete with all necessary luminaires and end plates. Hangers are ordered separately.

т		= T5 Fluorescent Lamp Code
		= 15 Fluorescent Lamp Code

Lamp Wattage (see chart below)

Number of Lamps in Length, specify 1 or 2

Example: T155 = 4' (1.2m) housing with one 54W T5HO lamp

	T5	T5HO		
Code	Lamp(s)	Code	Lamp(s)	
	a		в	
T114	1 x F14T5	T124	1 x F24T5/HO	
T121	1 x F21T5	T139	1 x F39T5/HO	
T128	1 x F28T5	T155	1 x F55T5/HO	
T135	1 x F35T5	T180	1 x F80T5/HO	
T221	2 x F21T5	T239	2 x F39T5/HO	
T228	2 x F28T5	T255	2 x F55T5/HO	
	T114 T121 T128 T135 T221	Code Lamp(s) T114 1 × F14T5 T121 1 × F21T5 T128 1 × F28T5 T135 1 × F35T5 T221 2 × F21T5	Code Lamp(s) Code a	

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

4 Mounting

S = Ceiling mount

For use with cantilevers, pendant stems or cable hangers (order separately) x

5 Finish

- 22 = Matte white
- Custom RAL or computer matched color to be specified, consult sales representative 90

REV. 6/06

elliptipar

6 Voltage/Ballast

Electronic

= 120V = 277V = 347V (Canada) 2 3

Project:

- v
- * Consult sales representave for dimming 5' lamps (lamp codes Tx35, Tx80).

Note: When dimming X mount luminaires, order two (2) electrical feeds to accommodate the control circuit.

Max. Ro	w Length ,	per Feed (4' lamps)	
Voltage	Lamp	Cantilever, Stern *	Cable **
120V	T5	228' (69.5m)	140' (42.7m)
1200	T5HO	124' (37.8m)	76' (23.2m)
277V	T5	532' (162.2m)	332' (101.2m)
2//V	T5HO	296' (90.2m)	184' (56.1m)

Based on 16A branch circuit capacity (20A max allowed for #14 AWG thru wire). ** Based on 10A capacity of 18/3 cord.

7 Option (See Accessories Section for specifications)

- 00 = No option 0E = Integral emergency battery pack with indicator lamp and test button. Available in 4¹, 5¹, 6² and 8¹ units (lamp codes T128, T135, T221, T228, T155, T239 and T255). Operates one lamp.
 Note: For X mount, order two (2) electrical feed cantilevers, stems or cables to accomodate unswitched feed to battery.
 OK = Prewired modular #14 AWG through wiring with a wirk connected.
- quick connectors.
- quick combination of emergency battery pack and prewired modular through wiring as described above.
 Note: Modular wiring does NOT accomodate unswitched supply to battery. Feed unswitched circuit directly to this unit.
 XX = For modification not listed, include detailed description.
- Consult factory prior to specification.

8 Standard

- 0 = UL. Underwriters Laboratories
- = CSA, Canadian Standards Association

Example

F144 - T155 - X - 22 - T - 000

Xtra small enclosed semi-elliptical, one-way series for use with one 4' F54T5HO lamp, 48' long housing (not including decorative end plates). For use with cantilever, pendant stem or cable hangers (order separately). Matte white, Integral 120V dimming ballast. Vertical straight blade baffles finished matte gray. UL. Order decorative end plates separately.

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

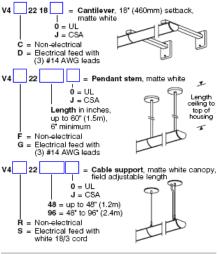
Hangers

Type:

Order separately. See Accessories Section for specifications. Singles - order one non-electrical and one electrical feed hanger for each module (X mount).

Rows - order one non-electrical hanger for each module (X mount) plus one electrical feed for each row. See Voltage/Ballast for maximum row length per electrical feed. Note: For each single or row with dimming (voltage/ballast code T or V) or for each module with emergency battery (option code 0E), order one additional electrical feed and subtract one non-electrical hanger. Cantilever and stem electrical feeds must be located at an

end of row. Cable feed can be located at ends or intermediate joints.



Accessories

Order separately. See Accessories Section for specifications.

ADE44220 = Decorative end plates, pair, matte white, or custom color to match housing (see 5 Finish) Note: adds 1/4" (6mm) to length

ABK = Blank-Out Cover for non-lighted module. Extruded cover replaces baffle, reflector and lamp(s). Painted to match housing. Consult factory for assistance.

The external shapes of the asymmetric reflectors are trademarks of elliptipar. Certain products illustrated may be overed by applicable patents and option of the patent For a list of patents, see Contents pages. These specifications supersede all prior publications and are subject to change without notice. ©2006 elliptipar.

Style 144

Lamp Type F4



Ballast Type F4

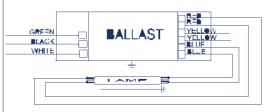


Electrical Specifications

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

Lamp Туре	Num. of Lamp s	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	0.16	19	1.07	20	0.98	1.7	5.63
F14T5	2	14	0/-18	0.29	34	1.06	10	0.98	1.7	3.12
F21T5	1	21	0/-18	0.21	26	1.03	15	0.99	1.7	3.96
F21T5	2	21	0/-18	0.40	48	1.02	10	0.98	1.7	2.13
* F28T5	1	28	0/-18	0.28	33	1.04	10	0.98	1.7	3.15
F28T5	2	28	0/-18	0.55	64	1.03	10	0.99	1.7	1.61
F35T5	1	35	0/-18	0.34	41	1.01	10	0.98	1.7	2.46
F35T5	2	35	0/-18	0.67	80	1.00	10	0.99	1.7	1.25

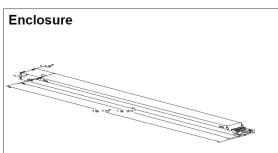
Wiring Diagram



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

Standard Lead Length (inches)

in.	cm.		in.	cm.
0	0	Yellow/Blue	0	0
0	0	Blue/White	0	0
0	0	Brown	0	0
0	0	Orange	0	0
0	0	Orange/Black	0	0
0	0	-	0	0
0	0	Red/White	0	0
	0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 Yellow/Blue 0 0 Blue/White 0 0 Brown 0 0 Orange 0 0 Blue/White 0 0 Orange 0 0 Black/White	0 0 111. 0 0 Yellow/Blue 0 0 0 Blue/White 0 0 0 Brown 0 0 0 Orange 0 0 0 Black/White 0



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 08/21/2006



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

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

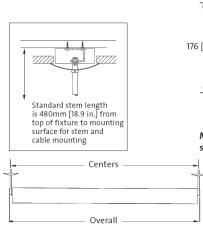
Fixture Type F5

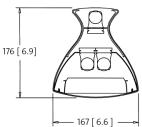
Ordering Guide

Stylus C6 Series Pendant $\left(\right)$

Mounting Information

Nominal	Overall	Centers
Length	mm [in]	mm [in]
4' T5	1235 [48.6]	1219 [48.0]
8' T5	2454 [96.6]	2438 [96.0]
12' T5	3674 [144.6]	3658 [144.0]
4′ T8	1284 [50.6]	1268 [49.9]
8′ T8	2552 [100.5]	2536 [99.8]
12′ T8	3820 [150.4]	3804 [149.8]





Model Shown: specular parabolic louver



Photometrics on reverse

C6	Length	Body/Wings	Light Control Up/Down	Mounting Finish	Source Voltage
B 2 - lamps direct	4 4' long 6 6' long 8	▼ solid P perforated body strip S light slot Wings ✓ X none P* perforated S* solid	Light Control Up U open top C clear dust cover Light Control J solid cross blade baffle	 Mounting solid stem aircraft cable standard 480mm [18.9"] or indicate length 	¥ Source 4 тв 5 т5 6 т5 но
E 1 - lamp direct 1 - lamp indirect	8' long C 12' long R continuous rows	* NOTE: Wings shipped in 4 foot sections on 4-8-12' long bodies and in 3 foot sections on 6' long body.	 Solid cross blade baffle and opal overlay Perforated cross blade baffle Perforated cross blade baffle and opal overlay Specular parabolic louver specular parabolic louver and opal overlay 	Finish W white S special finish: indicate paint # and manufacturer will be matched by Metalumen	Voltage A 120 Volt B 277 Volt C 347 Volt



Approvals

R1-06-03



METALUMEN MANUFACTURING INC. 570 Southgate Drive, Guelph, Ontario N1G 4P6 Mailing Address: P.O. Box 1779, Guelph, Ontario N1H 6Z9 toll free 1-800-621-6785 t 519-822-4381 f 519-822-4589

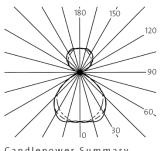
www.metalumen.com

Signature

Date

Photometrics

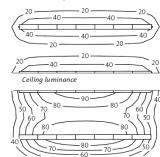
Distribution Curve



Candlepower Summary Angle 0.0 22.5 45 67.5 90 Output

						Lumens
0	1454	1454	1454	1454	1454	8.7
5	1453	1469	1458	1489		131.44
15	1385	1414	1446	1507		412.3
25	1304	1343	1406	1453	1463	646.33
35	1155	1207	1243	1250	1271	771.59
45	929	1003	990	988	994	763.31
55	548	596	591	567	558	517.44
65	33	62	146	219	247	140.7
75	3	3	6	38	60	
85	1	2	1	1	0	0.92
90	2	2	3	3	3	1.44
95	42	40	34	29	31	
105	145	155	133	124		143.74
115	260	296	270	257		267.88
125	375	414	415	401	384	361
135	477	519	539	540		407.55
145	563	601	627	649		388.54
155	641	653	682	692		312.67
165	692	684	699	704		198.11
175	715	718	717	706	697	
180	712	712	712	712	712	4.26

Room Layout



Horizontal footcandles

10.7(L) x 9.1(W) x 3.0(H)m [35 x 30 x 10 ft] Reflectances: 80/50/20 Maintenance factor: 0.70 Fixture spacing: 3.0m [10'-0"] Pendant length: 457mm [18"]

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Luminaire
0-30	1199	13.8	21.4
0-40	1970	22.6	35.2
0-60	3251	37.4	58.2
0-90	3414	39.2	61.1
90-120	441	5.1	7.9
90-130	802	9.2	14.3
90-150	1598	18.4	28.6
90-180	2177	25.0	38.9
0-180	5591	64.3	100.0

Stylus c6 Series

T83Lamps



Photometric report file # C6F4NUK-4 Efficiency 64.3% 38.9% Indirect- 61.1% Direct Model Shown 3-FO32-T8 Lamps (1 up-2 down) Solid body with specular parabolic louver

Coefficients of Utilization Zonal Cavity Method Effective Floor Cavity Reflectance = .20

RC 80 70 50 RW 70 50 30 10 70 50 30 10 50 30 10 RCR 0 70 1 65 2 60 3 55 4 51 5 47 6 43 7 40 8 37 9 34 10 32 70 63 55 49 44 39 35 32 29 27 57 57 57 70 70 66 66 66 57 49 43 37 33 29 26 23 21 19 66
 57
 57

 51
 50

 46
 44

 41
 38

 37
 34

 33
 30

 30
 26

 27
 24

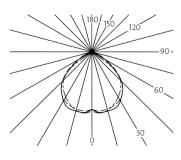
 25
 21

 23
 19

 21
 17
 60 52 45 61 56 51 47 44 40 37 35 32 30 59 52 46 42 37 34 30 28 25 23 58 49 36 31 27 24 21 19 17 55 46 40 34 30 26 23 20 18 16 49 42 36 31 27 24 21 19 17 15 39 34 30 27 24 22

Laboratory results may not be representative of field performance. Ballast factors have not been applied.

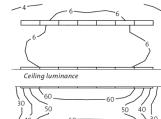
Distribution Curve

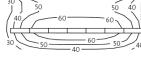


Candlepower			Summary			
Angle	0.0	22.5	45	67.5	90	Output Lumens

0	1423	1423	1423	1423	1423	8.51
5	1400	1474	1471	1480	1505	131.47
15	1400	1423	1444	1473	1504	410.46
25	1282	1329	1394	1434	1461	639.74
35	1126	1207	1256	1250	1256	770.17
45	930	998	993	990	1001	764.09
55	555	604	598	576	555	523.27
65	36	67	150	224	245	144.3
75	3	2	7	39	64	21.55
85	1	1	1	1	0	0.71
90	0	0	0	0	0	0

Room Layout





Horizontal footcandles

10.7(L) x 9.1(W) x 3.0(H)m [35 x 30 x 10 ft] Reflectances: 80/50/20 Maintenance factor: 0.70 Fixture spacing: 3.0m [10'-0"] Pendant length: 457mm [18"]

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Luminaire
0-30	1190	20.5	34.9
0-40	1960	33.8	57.4
0-60	3248	56.0	95.1
0-90	3414	58.9	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	3414	58.9	100.0

194

T8 2 Lamps

24 20



Photometric report file # C6B4NUK-4 Efficiency 58.9% 100 % direct Model Shown 2-FO32 T8 Lamps Solid body with specular parabolic louver

Coefficients of Utilization Zonal Cavity Method Effective Floor Cavity Reflectance = .20

RC		8	0			7	0			50	
RW	70	50	30	10	70	50	30	10	50	30	10
RCR											
0	70	70	70	70	68	68	68	68	65	65	65
1	65	63	61	59	64	62	60	58	59	58	56
2	60	56	53	50	59	55	52	50	53	51	49
3	56	50	46	43	54	50	46	43	48	45	42
4	51	45	41	37	50	45	40	37	43	40	37
5	47	41	36	33	46	40	36	33	39	35	32
6	44	37	32	29	43	36	32	29	35	31	28
7	41	34	29	26	40	33	29	25	32	28	25
8	38	31	26	23	37	30	26	23	30	26	23
9	36	28	24	21	35	28	24	21	27	23	20
10	33	26	22	19	33	26	21	19	25	21	19

Laboratory results may not be representative of field performance. Ballast factors have not been applied.

Pendant



Lamp Type F5

	Product Number:	20904
	Order Abbreviatio	n: FP54/835/HO/ECO
Franking and Andrews	General Description:	54W, T5 PENTRON high output (HO) fluorescent lamp, 3500K color temperature, rare earth phosphor, 85 CRI, ECOLOGIC
	Product Inform	ation
Abbrev. With Packaging Info.	FP54	835HOECO 40/CS 1/SKU
Actual Length (in)	45.8	
Actual Length (mm)	1163	.2
Average Rated Life (hr)	2500	0
Base	Minia	ture Bipin
Bulb	T5	
Color Rendering Index (CRI)	85	
Color Temperature/CCT (K)	3500	
Diameter (in)	0.67	
Diameter (mm)	17.0	
Family Brand Name	PENT	RON® ECO®
Initial Lumens at 25C	4450	
Initial Lumens at 35C	5000	
Mean Lumens at 25C	4138	
Mean Lumens at 35C	4650	
Nominal Length (in)	48	

Ballast Type F5

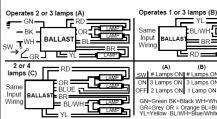


Electrical Specifications

ICN4S5490C2LS@120							
CENTIUM T5							
Electronic							
Programmed Start							
Series/Parallel							
120							
50/60 HZ							
Active							

Lamp Type	Num. of Lamp s	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.
* F54T5/HO	1	54	-20/-29	0.52	62	0.99	15	0.98	1.7	1.60
F54T5/HO	2	54	-20/-29	0.99	118	0.99	10	0.98	1.7	0.84
F54T5/HO	3	54	-20/-29	1.52	182	1.00	10	0.98	1.7	0.55
F54T5/HO	4	54	-20/-29	2.00	240	1.00	10	0.98	1.7	0.42

Wiring Diagram



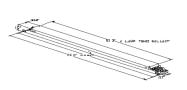
BL/WH RD = (A) (B) (C) # Lamps ON 4 Lamps ON amp # Lamps C 3 Lamps C 3 Lamps ON OFF 2 Lamps ON 1 Lamp ON 2 Lamps ON GN=Green BK=Black WH=WhiRD=Red GR=Grey OR = Orange BL=Blue BR=Brown YL=Yellow BL/WH=Blue/White

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

Standard Lead Length (inches)

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

Enclosure



Enclosure Dimensions

0	OverAll (L)	Width (W)	Height (H)	Mounting (M)
	24 "	1.18 "	1 "	23.64 "
	24	1 9/50	1	23 16/25
	61 cm	3 cm	2.5 cm	60 cm



Revised 01/31/2007

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

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

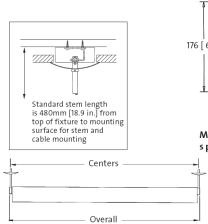
Fixture Type F6

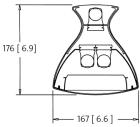
Ordering Guide

Stylus C6 Series Pendant $\left| \right| \left| \right\rangle$

Mounting Information

Nominal	Overall	Centers
Length	mm [in]	mm [in]
4' T5	1235 [48.6]	1219 [48.0]
8' T5	2454 [96.6]	2438 [96.0]
12' T5	3674 [144.6]	3658 [144.0]
4′ T8	1284 [50.6]	1268 [49.9]
8′ T8	2552 [100.5]	2536 [99.8]
12′ T8	3820 [150.4]	3804 [149.8]





Model Shown: specular parabolic louver



Photometrics on reverse

Series Model	Length	Body/Wings	Light Control Up/Down	Mounting Finish	Source Voltage
A 1 - lamp direct B 2 - lamps direct C 1 - lamp direct 1 - lamp indirect F 2 - lamps direct 1 - lamp direct 1 - lamp indirect	4 'long 6 'long 8 'long C 12'long R continuous rows	 N solid P perforated body strip S light slot Wings X none P* perforated S* solid * NOTE: Wings shipped in 4 foot sections on 4-8-12' long bodies and in 3 foot sections on 6' long body. 	Light Control Up U open top C clear dust cover Light Control Down J solid cross blade baffle O solid cross blade baffle and opal overlay L perforated cross blade baffle and opal overlay K specular parabolic louver Z specular parabolic louver and opal overlay	Mounting solid stem aircraft cable standard 480mm [18.9"] or indicate length Finish W white S special finish: indicate paint # and manufacturer will be matched by Metalumen 	Source 4 T8 5 T5 6 T5 HO Voltage A 120 Volt B 277 Volt C 347 Volt
I I					P1 06 03



Approvals

R1-06-03



METALUMEN MANUFACTURING INC. 570 Southgate Drive, Guelph, Ontario N1G 4P6 Mailing Address: P.O. Box 1779, Guelph, Ontario N1H 6Z9 toll free 1-800-621-6785 t 519-822-4381 f 519-822-4589

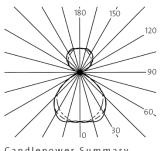
www.metalumen.com

Signature

Date

Photometrics

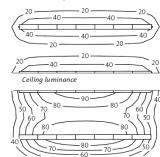
Distribution Curve



Candlepower Summary Angle 0.0 22.5 45 67.5 90 Output

						Lumens
0	1454	1454	1454	1454	1454	8.7
5	1453	1469	1458	1489		131.44
15	1385	1414	1446	1507		412.3
25	1304	1343	1406	1453	1463	646.33
35	1155	1207	1243	1250	1271	771.59
45	929	1003	990	988	994	763.31
55	548	596	591	567	558	517.44
65	33	62	146	219	247	140.7
75	3	3	6	38	60	
85	1	2	1	1	0	0.92
90	2	2	3	3	3	1.44
95	42	40	34	29	31	
105	145	155	133	124		143.74
115	260	296	270	257		267.88
125	375	414	415	401	384	361
135	477	519	539	540		407.55
145	563	601	627	649		388.54
155	641	653	682	692		312.67
165	692	684	699	704		198.11
175	715	718	717	706	697	
180	712	712	712	712	712	4.26

Room Layout



Horizontal footcandles

10.7(L) x 9.1(W) x 3.0(H)m [35 x 30 x 10 ft] Reflectances: 80/50/20 Maintenance factor: 0.70 Fixture spacing: 3.0m [10'-0"] Pendant length: 457mm [18"]

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Luminaire
0-30	1199	13.8	21.4
0-40	1970	22.6	35.2
0-60	3251	37.4	58.2
0-90	3414	39.2	61.1
90-120	441	5.1	7.9
90-130	802	9.2	14.3
90-150	1598	18.4	28.6
90-180	2177	25.0	38.9
0-180	5591	64.3	100.0

Stylus c6 Series

Pendant

T83Lamps



Photometric report file # C6F4NUK-4 Efficiency 64.3% 38.9% Indirect- 61.1% Direct Model Shown 3-FO32-T8 Lamps (1 up-2 down) Solid body with specular parabolic louver

Coefficients of Utilization Zonal Cavity Method Effective Floor Cavity Reflectance = .20

RC 80 70 50 RW 70 50 30 10 70 50 30 10 50 30 10 RCR 0 1 2 3 4 5 6 7 70 63 55 49 44 39 35 32 29 27 57 57 57
 0
 70

 1
 65

 2
 60

 3
 55

 4
 51

 5
 47

 6
 43

 7
 40

 8
 37

 9
 34

 10
 32
 70 70 66 66 66 57 49 43 37 33 29 26 23 21 19 66
 57
 57

 51
 50

 46
 44

 41
 38

 37
 34

 33
 30

 30
 26

 27
 24

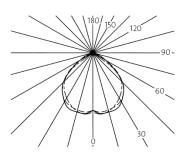
 25
 21

 23
 19

 21
 17
 60 52 45 61 56 51 47 44 40 37 35 32 30 59 52 46 42 37 34 30 28 25 23 58 49 36 31 27 24 21 19 17 55 46 40 34 30 26 23 20 18 16 49 42 36 31 27 24 21 19 17 15 39 34 30 27 24 22

Laboratory results may not be representative of field performance. Ballast factors have not been applied.

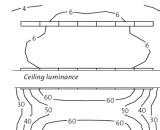
Distribution Curve

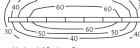


Candlepower			Summary				
Angle	0.0	22.5	45	67.5	90	Output Lumens	

0	1423	1423	1423	1423	1423	8.51
5	1400	1474	1471	1480	1505	131.47
15	1400	1423	1444	1473	1504	410.46
25	1282	1329	1394	1434	1461	639.74
35	1126	1207	1256	1250	1256	770.17
45	930	998	993	990	1001	764.09
55	555	604	598	576	555	523.27
65	36	67	150	224	245	144.3
75	3	2	7	39	64	21.55
85	1	1	1	1	0	0.71
90	0	0	0	0	0	0

Room Layout





Horizontal footcandles

10.7(L) x 9.1(W) x 3.0(H)m [35 x 30 x 10 ft] Reflectances: 80/50/20 Maintenance factor: 0.70 Fixture spacing: 3.0m [10'-0"] Pendant length: 457mm [18"]

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Luminaire		
0-30	1190	20.5	34.9		
0-40	1960	33.8	57.4		
0-60	3248	56.0	95.1		
0-90	3414	58.9	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	3414	58.9	100.0		

T8 2 Lamps

24 20



Photometric report file # C6B4NUK-4 Efficiency 58.9% 100 % direct Model Shown 2-FO32 T8 Lamps Solid body with specular parabolic louver

Coefficients of Utilization Zonal Cavity Method Effective Floor Cavity Reflectance = .20

RC		8	0			7	70				50	
RW	70	50	30	10	70	50	30	10	50	30	10	
RCR												
0	70	70	70	70	68	68	68	68	65	65	65	
1	65	63	61	59	64	62	60	58	59	58	56	
2	60	56	53	50	59	55	52	50	53	51	49	
3	56	50	46	43	54	50	46	43	48	45	42	
4	51	45	41	37	50	45	40	37	43	40	37	
5	47	41	36	33	46	40	36	33	39	35	32	
6	44	37	32	29	43	36	32	29	35	31	28	
7	41	34	29	26	40	33	29	25	32	28	25	
8	38	31	26	23	37	30	26	23	30	26	23	
9	36	28	24	21	35	28	24	21	27	23	20	
10	33	26	22	19	33	26	21	19	25	21	19	

Laboratory results may not be representative of field performance. Ballast factors have not been applied.

Lamp Type F6



Ballast Type F6

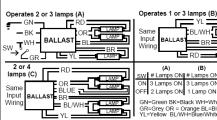


Electrical Specifications

ICN4S5490C2LS@120						
CENTIUM T5						
Electronic						
Programmed Start						
Series/Parallel						
120						
50/60 HZ						
Active						

Lamp Type	Num. of Lamp s	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.
* F54T5/HO	1	54	-20/-29	0.52	62	0.99	15	0.98	1.7	1.60
F54T5/HO	2	54	-20/-29	0.99	118	0.99	10	0.98	1.7	0.84
F54T5/HO	3	54	-20/-29	1.52	182	1.00	10	0.98	1.7	0.55
F54T5/HO	4	54	-20/-29	2.00	240	1.00	10	0.98	1.7	0.42

Wiring Diagram



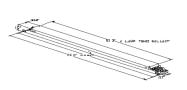
BL/WH RD = (A) (B) (C) # Lamps ON 4 Lamps ON amp # Lamps C 3 Lamps C 3 Lamps ON OFF 2 Lamps ON 1 Lamp ON 2 Lamps ON GN=Green BK=Black WH=WhiRD=Red GR=Grey OR = Orange BL=Blue BR=Brown YL=Yellow BL/WH=Blue/White

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)
24 "	1.18 "	1 "	23.64 "
24	1 9/50	1	23 16/25
61 cm	3 cm	2.5 cm	60 cm



Revised 01/31/2007

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

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

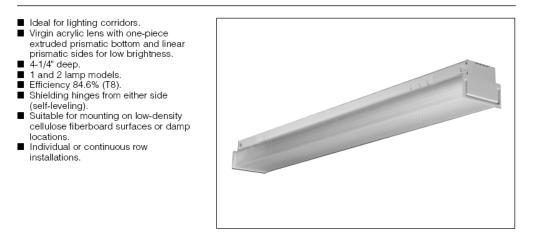
Corporate Offices: Phone: 800-322-2086

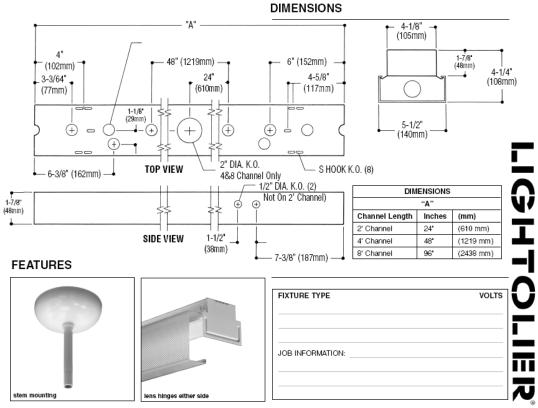
Fixture Type F7

JS SERIES 5-1/2" WIDE

JETSTAR

CORRIDOR LUMINAIRE 5-1/2" WIDTH, 24', 48", 96" NOMINAL LENGTHS 1 OR 2 LAMP, T8 OR T12





SECTION 3A/Folio H96-10

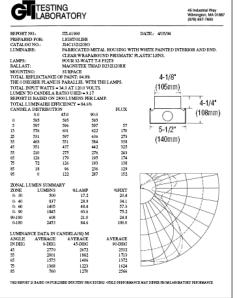
JS SERIES 5-1/2" WI JETSTAR D CORRIDOR LUMINAIRE

PHOTOMETRY

MODEL NO. JS4C132120SO

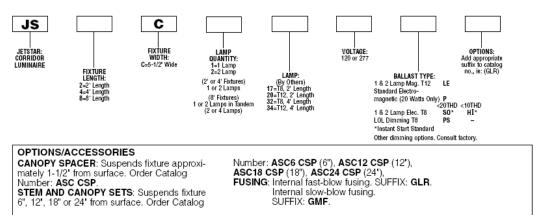
LER = FW - 72.0 Watts - 34 BF - 1.0

Comparative yearly lighting energy cost per lumens. = \$3.33



	-		-	avity method			r cavity reflectance 0.20)
RF		20			20		20
RC		80			50		30
BW	70	50	30	50	30	10	50 30 10
1	86	82	78	70	68	65	64 62 60
· <u>S</u> 2	78	71	66	62	57	54	56 52 49
c atio	72	63	56	54	49	45	49 45 42
	66	56	48	48	43	39	44 40 36
4 5 6	60	50	42	43	38	34	40 35 31
86	56	45	38	39	34	29	36 31 28
§ 7	52	41	33	36	30	26	33 28 24
502 B	48	37	30	33	27	23	30 25 22
9	45	34	27	30	25	21	28 23 20
10	42	31	25	28	22	19	26 21 18

ORDERING INFORMATION Explanation of Catalog Number. Example: JS4C132120SOGLR



SPECIFICATIONS:

PERFORMANCE: In an installation of 1 lamp 40W luminaires in a room cavity ratio of 1, with reflectance of 80% ceiling, 50% wall, 20% floor, the C.U. shall not be less than .82. To reduce glare the average bright-ness at 65° shall not exceed 1575 footlamberts. To control veiling reflections, luminaire output in the 30°-90° zone shall be not less than 46.4%

MATERIALS: Chassis parts are die-formed code gauge cold rolled steel. Housing is reinforced for rigidity. Refractor-one-piece virgin acrvlic.

FINISH: Chassis exterior-white baked polyester enamel. Cavity-white baked polyester enamel minimum 86% reflectance. Phosphate under-coating. LENS: One-piece extruded prismatic pattern 12 bottom and linear prism

side walls.

Side wais.
ELECTRICAL: Thermally protected class "P" ballast C.B.M. approved, non PCB. If K.O. is within 3" of ballast, use wire suitable for at least 90°.
LABELS: I.B.E.W./UL and C-UL.



Lamp Type F7

	Product Number:	21779
and the second second	Order Abbreviation:	F032/835/EC0
Rammer & Control of Co	General Description:	32W, 48" MOL, T8 OCTRON fluorescent lamp, 3500K color temperature, rare earth phosphor, 82 CRI, suitable for IS c RS operation, ECOLOGIC
	Product Inform	nation
Abbrev. With Packaging Info.	F	F032835EC0 30/CS 1/SKU
Actual Length (in)	4	+7.78
Actual Length (mm)	:	1213.6
Average Rated Life (hr)	3	30000
Base	١	Aedium Bipin
Bulb	٦	18
Color Rendering Index (CRI)	8	32
Color Temperature/CCT (K)	3	3500
Diameter (in)	:	1.10
Diameter (mm)	2	27.9
Family Brand Name	(Octron® 800, Ecologic
Industry Standards	Å	NSI C78.81 - 2001
Initial Lumens at 25C	2	2950
Mean Lumens at 25C	2	2710
Nominal Length (in)	4	48
Norminal Eerigen (m)		

Ballast Type F7

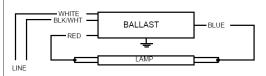


Electrical Specifications

RCN-1P32-SC						
Brand Name	CENTIUM					
Ballast Type	Electronic					
Starting Method	Instant Start					
Lamp Connection	Parallel					
Input Voltage	120					
Input Frequency	50/60 HZ					
Status	Active					

Lamp Type	Num. of Lamp s	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.
F17T8	1	17	0/-18	0.18	20	0.92	20	0.93	1.7	4.60
F25T8	1	25	0/-18	0.22	27	0.92	10	0.98	1.7	3.41
* F32T8	1	32	0/-18	0.27	32	0.92	10	0.99	1.7	2.88

Wiring Diagram



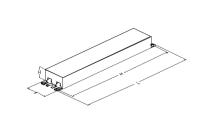
Diag. 63

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

Standard Lead Length (inches)

	1	-			
	in.	cm.		in.	cm
Black			Yellow/Blue		
White	25.0		Blue/White		
Blue	31.0		Brown		
Red	37.0		Orange		
Yellow			Orange/Black		
Gray			Black/White	25.0	
Violet			Red/White		

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 08/26/2002

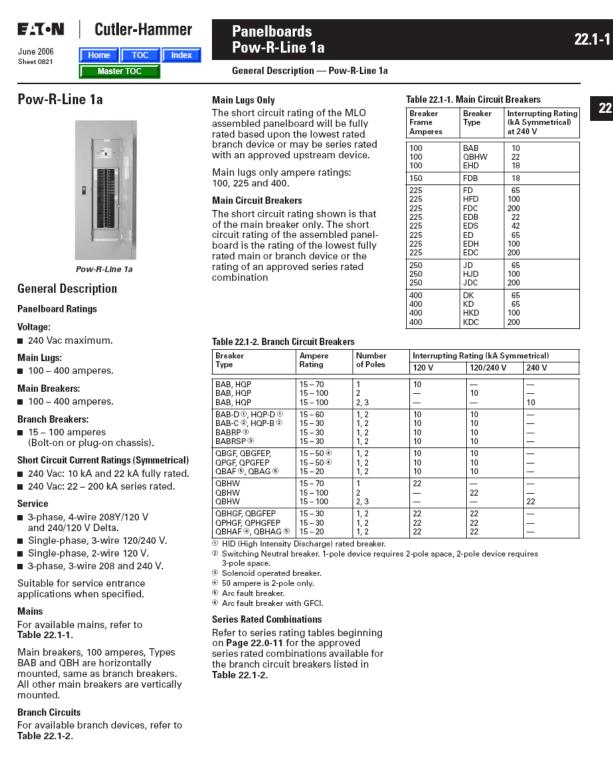
Data is based upon tests performed by Advance Transformer in a controlled environment and representative of relative performance. Actual performance can vary depending on operating conditions. Specifications are subject to change without notice. All specifications are nominal unless otherwise noted.

ADVANCE

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

Appendix B-1

Panelboards M3, L5, L6, E



22.1-2 Panelboards Pow-R-Line 1a

Technical Data — Pow-R-Line 1a

22

Pow-R-Line 1a Specifications

Bussing

100 – 400 amperes: Tin-plated aluminum is standard, copper is available as an option.

Boxes

Boxes are made from code-gauge galvanized steel.

Blank ends are supplied as standard, knockouts are available upon request.

EZ Trim

Trims are made from code-gauge steel and painted ANSI 61 gray.

All panelboards have door-in-door as standard with multi-point catch and lock, and concealed mounting hardware.

Modifications

Table 22.1-3. Sub-Feed Lugs (Main Lugs Only)

Amperes	Panel Height Addition
	0 Inches (0 mm) 0 Inches (0 mm)

Table 22.1-4. Through-Feed Lugs

Amperes	Information
100	See Table 22.1-6
225	See Table 22.1-6
400	See Table 22.1-6

Table 22.1-5. Sub-Feed Breakers (One Per Panel)

Ampere Rating	Breaker Type	Interrupting Rating (kA Symmetrical) at 240 V
150	FDB	18
225 225 225 225 225 225 225 225 225 225	FD HFD FDC EDB EDS ED EDH EDC	65 100 200 22 42 65 100 200
250 250 250	NDC HID ND	65 100 200
400 400 400 400	DK KD HKD KDC	65 65 100 200

Shunt Trips

Shunt trips are available on breakers. BAB, HQP, QBHW and QPHW require one additional pole space for shunt trip, i.e., 1-pole is 2-pole size, 2-pole is 3-pole size and 3-pole is 4-pole size.

Ground Bar

Standard bolted in box. Aluminum is standard. Copper is available as an option.

Enclosures

Types 1, 12, 3R, 4 and 4X.

TVSS

Integrated onto panelboard chassis. For complete product description and available ratings, refer to **Section 36**.

Box Sizing and Selection

Box size for all Type 1 panelboards are available from **Table 22.1-6**.

Instructions

- Select the rating and type of mains required.
- Count total number of branch circuit poles (including spaces) required in the panelboard. Do not count main breaker poles. Convert 2- or 3-pole branch breakers to single-poles, i.e., 3-pole breaker, count as three poles.

Note: For horizontal mounted mains (BAB Type), use main lug table, include space in branch section for mains.

E-T-N Cutler-Hammer

Home TOC Index June 2006 Sheet 0822

 Using correct table, type of mains and ampere rating per Step 1, find total number of poles.

Note: Where total number of poles (Step 2) fall between number in table, use the next higher number.

 Read box size across columns to the right.

Top and Bottom Gutters (minimum)

5-1/2 inches (139.7 mm).

Side Gutters

20-inch (508.0 mm) wide box: 6-1/2 inches (165.1 mm).

Table 22.1-6. Type 1 Panelboards — Dimensions in Inches (mm)

Ampere	Main Breaker Type		Maximum	Box Dimens	sions 🔍	
Rating of Mains	Mounting Position		Number of Branch Circuits Including Provisions	Height	Width	Depth
100 Amperes						
100 A Main Lugs or Main Breaker	EHD, FDB, FD, HFD, FDC Vertical		18 30 42 48	36 (914.4) 48 (1219.2) 48 (1219.2) 60 (1524.0)	20 (508.0) 20 (508.0) 20 (508.0) 20 (508.0) 20 (508.0)	5.75 (146.1) 5.75 (146.1) 5.75 (146.1) 5.75 (146.1)
100 A Main Lugs or Main Breaker with 100 A Through-Feed Lugs or Sub-Feed Breaker	EHD, FDB, FD, HFD, FDC Vertical		18 30 42 48	48 (1219.2) 48 (1219.2) 60 (1524.0) 60 (1524.0)	20 (508.0) 20 (508.0) 20 (508.0) 20 (508.0) 20 (508.0)	5.75 (146.1) 5.75 (146.1) 5.75 (146.1) 5.75 (146.1) 5.75 (146.1)
225 Amperes						
225 A	EDB, EDS, ED, EDH, EDC, FD, HFD, FDC Vertical		18 30 42 48	36 (914.4) 48 (1219.2) 48 (1219.2) 60 (1524.0)	20 (508.0) 20 (508.0) 20 (508.0) 20 (508.0)	5.75 (146.1) 5.75 (146.1) 5.75 (146.1) 5.75 (146.1)
225 A Main Lugs or Main Breaker with 225 A or 100 A Sub-Feed Lugs or Breaker	EHD, FDB, FD, I FDC, EDB, EDS ED, EDH, EDC Vertical		18 30 42 48	48 (1219.2) 48 (1219.2) 60 (1524.0) 60 (1524.0)	20 (508.0) 20 (508.0) 20 (508.0) 20 (508.0) 20 (508.0)	5.75 (146.1) 5.75 (146.1) 5.75 (146.1) 5.75 (146.1) 5.75 (146.1)
400 Amperes						
400 A Main Lugs or Main Breaker	DK, KD, HKD, KDC Vertical		18 30 42 48	60 (1524.0) 60 (1524.0) 72 (1828.8) 72 (1828.8)	20 (508.0) 20 (508.0) 20 (508.0) 20 (508.0)	5.75 (146.1) 5.75 (146.1) 5.75 (146.1) 5.75 (146.1)
400 A Main Lugs or Main Breaker with 225 A	DK, KD, HKD, KDC Vertical	Mains	18 30 42	60 (1524.0) 72 (1828.8) 72 (1828.8)	20 (508.0) 20 (508.0) 20 (508.0)	5.75 (146.1) 5.75 (146.1) 5.75 (146.1)
or 100 A Sub-Feed Lugs or Breaker	EHD, FDB, FD, HFD, FDC, EDB, EDS, ED, EDH, EDC Vertical	Sub- Feed Breakers	48	90 (2286.0)	20 (508.0)	5.75 (146.1)

Smaller panelboard box sizes are available if required. Contact Eaton for application information.

2 Add 8 inches (203.2 mm) for TVSS.

I For horizontal mounted mains (BAB Type), use main lug table, include space in branch

section for mains.

④ JD, HJD, JDC is same space requirement as 400 ampere DK, HKD, KDC.



LIGHTING PLAYBACK CONTROLLERS

SHEPHERDS BUILDING, ROCKLEY ROAD, LONDON W14 0DA, UNITED KINGDOM www.pharoscontrols.com

OVERVIEW

The Pharos control solution has two complementary parts: a Lighting Playback Controller (LPC) which forms a permanent part of the installation, and the Designer software which runs on any personal computer and is only required when creating or modifying the lighting presentation.

Many playback controllers for lighting installations store the show as frames of control data and so playback consists of outputting these frames in sequence. However this is a very limited way to control lighting. Because the show data is stored in such a raw form it takes up a lot of memory and that imposes limits on the length of the show. Furthermore it can only reproduce its output exactly as programmed every time, which means that there is no ability to separate the lighting into multiple zones with discrete intensity control or provide interactive triggering beyond a simple start and stop.

The Pharos Lighting Playback Controllers are intended to be price-competitive with these framestore solutions but offer genuine lighting control functionality. Lighting is programmed on timelines with a particular timeline having control data for one, some or all the lighting fixtures being controlled. Multiple timelines are supported and so a single unit can control multiple distinct zones, or more complex presentations can be programmed with external triggers coming from multiple systems.

The LPCs are provided in a compact DIN-rail compatible housing for mounting within an electrical cabinet, or alternatively they can be wall-mounted. For easy installation most connections are provided as plug-strips. The solid state design with efficient, embedded firmware ensures unparalleled reliability.

The extensive range of external triggering interfaces supported by the LPC includes Ethernet,RS232 serial, MIDI and digital inputs. Additional interfaces are supported by optional LPC Expansion Modules. Conditional logic, variables and scripts provide powerful show control functionality.

Multiple units can be used together for larger installations and synchronized automatically over Ethernet. The units have an internal web server with an active web page giving status and configuration information for remote monitoring, and either Ethernet or USB can be used to connect to the PC running the Designer software during programming.

VERSIONS

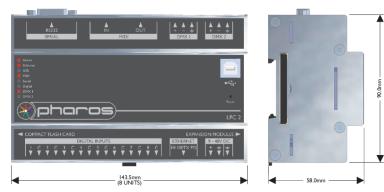
There are two versions of the Lighting Playback Controller:

- The LPC I is designed for smaller systems that can be controlled by a single standalone unit:
- One DMX512 output (up to 512 dimmers or 170 RGB colour-mixing units).
- Triggering via Ethernet, RS232 serial, MIDI and digital inputs.
- · Realtime clock with sunrise and sunset functions.
- Supports Expansion Modules for other protocols and interfaces. Model Number: PLPC1

The **LPC 2** is designed for larger systems and has the ability to synchronise itself with other LPC 2 units during playback making it a scalable solution:

- Two DMX512 outputs (up to 1024 dimmers or 340 RGB colour-mixing units).
- Triggering, realtime clock and Expansion Module support as the LPC I.
- Multiple units can be linked via Ethernet and will automatically synchronise playback and share triggers across the network.

Model Number: PLPC2





SPECIFICATIONS

General:

- Microprocessor based system specifically designed for the control of lighting in an architectural or entertainment application.
- Project data stored in non-volatile solid-state memory (Compact Flash Card), uploaded from a remote personal computer over an Ethernet, USB or web connection.
- Operating System stored in non-volatile solid-state memory, remotely updated when necessary from a personal computer over an Ethernet or USB connection.
- Commences playback automatically on receiving power without additional external trigger.
- without additional external trigger.
- Internal realtime clock operates when power is absent.
 Supports multiple LPC Expansion Modules for other interfaces and protocols, including RS485, audio, timecode and
- Interfaces and protocols, including R5485, audio, timecode and DALI.
- · Integrated web server.

Physical:

- Enclosure and mounting complies with DIN43880 and
- EN60715 (35/7.5 rail) respectively.
- 8 unit wide DIN enclosure.
- Operating temperature range 0°C to 50°C (32°F to 122°F).
- CE compliant and ETL/cETL listed.

Electrical:

Supports the following wire terminations (Camden Electronics CTB9208 5.08mm plug-in rising clamp terminals, supplied):

- 9V to 48V DC power. *
- Isolated DMX512 ports, RDM compatible (2).
- Isolated digital inputs (8, tri-mode: active high, active low or contact closure).

In addition there are the following standard connectors:

- RJ45 socket for 10/100Base-TX Ethernet
- IEEE 802.3af PoE powered device.
- USB-B socket for USB 1.1.
- 9-pin D plug for isolated RS232 serial.
 5-pin DIN socket for MIDI In.
- 5-pin DIN socket for MIDI M.
 5-pin DIN socket for MIDI Out.
- 25-pin D socket for Expansion Modules only.
- * Unit may be powered either via DC input or PoE.



North American Distributor 3031 PleasantView Road, PO Box 620979, Middleton WI 53562 0979 USA • Tel +1 608 831 4116 • Fax +1 608 836 1736 • www.etcarchitectural.com/pharos

Copyright © 2004-6 Pharos Architectural Controls Limited. All rights reserved. Specifications subject to change without notice (15-08-2006)

Specification

LPC 1

A.General

- i. The Controller shall be a microprocessor-based system specifically designed for control of lighting in an architectural or entertainment application. A personal computer running emulation software shall not be acceptable.
- ii. The Controller shall store show data in non-volatile solid-state memory. This memory shall be removeable for purposes of backup or disaster-recovery.
- iii. Show data may be downloaded from a remote personal computer over an Ethernet or USB connection.
- iv. The Operating Software of the Controller shall be stored in a dedicated non-removeable non-volatile solid-state memory. It shall be possible to update the Operating Software by download from a remote personal computer over an Ethernet or USB connection.
- v. The Controller shall commence show playback automatically on receiving power without additional external inputs.
- vi. The Controller shall have an internal real-time clock that continues to operate when external power is absent.
- vii. The Controller shall have a capacity of 512 channels of DMX512 with RDM.
- viii. There shall be visual indicators on the Controller showing status of the controller and its interfaces.
- ix. The Controller shall operate a web server on its Ethernet interface. This shall allow status information and configuration options to be accessed remotely.
- x. The Controller shall allow lighting to be programmed as separate zones, with independent triggering and manual intensity control.
- xi. The Controller shall support multiple expansion modules for support of other interfaces or protocols, including Lonworks, DALI and SMPTE Timecode.
- xii. The Controller shall have a recessed switch for resetting the unit without removal of power.

B.Physical

- i. Enclosure and mounting shall comply with EN60715 (35/7.5) and DIN43880
- ii. The unit shall be an 8 unit DIN enclosure (143.5mm x 90.0mm x 58.0mm)
- iii. The unit shall operate in a temperature range from 0°C to 60°C (32°F to 140°F)

C.Electrical

i.

- The Controller shall be designed to support the following wire terminations (Camden Electronics CTB9208 5.08mm plug-in rising clamp terminals):
 - a. 9V to 48V DC Power
 - b. Isolated DMX512 Out, RDM-compatible (1)
 - c. Isolated Digital Inputs (8, tri-mode: active high, active low or contact closure)
- ii. In addition there shall be the following standard connectors:
 - a. RJ45 socket for 10/100Base-TX Ethernet
 - b. USB-B Socket for USB 1.1
 - c. 9-pin D socket for isolated RS232 serial
 - d. 5-pin DIN connector for MIDI In
 - e. 5-pin DIN connector for MIDI Out
 - f. 25-pin D socket for Expansion Modules
- iii. The Controller shall be able to receive power over ethernet as an alternative to direct DC power (IEEE 802.3af PoE powered device).



LPC EXPANSION MODULES

SHEPHERDS BUILDING, ROCKLEY ROAD, LONDON W14 0DA, UNITED KINGDOM www.pharoscontrols.com

OVERVIEW

The Pharos control solution incorporates a variety of LPC Expansion Modules that add support for other protocols and interfaces as required. Up to two Expansion Modules can be added to a single Lighting Playback Controller.

Our current range of modules is listed here and we are constantly developing solutions to support other protocols or proprietary systems:

DALI MASTER



DALI is a popular architectural lighting control protocol and the Pharos DALI Master Expansion Module allows a single LPC to control up to 128 DALI ballasts:

- DALI Master, complies with EN60929.
- Control up to 64 ballasts per module.
- Interrogate ballasts remotely via LPC web server.
- 3-pin 5.08mm plug-in rising clamp terminal.*
- 4 unit wide DIN enclosure.
- CE compliant and ETL/cETL listed.

Model Number: PEXPDALIM

DALI SLAVE

DALI is a popular architectural lighting control protocol and the Pharos DALI Slave Expansion Module allows one or more LPCs to be triggered by a DALI controller:

- DALI Slave or Ballast, complies with EN60929.
- Trigger LPC(s) from DALI controller or wall/touch panel.
- Interrogate LPC(s) for maintenance via DALI controller.
- · Augment an existing DALI installation with LED and automated lights.
- 3-pin 5.08mm plug-in rising clamp terminal.*
- 4 unit wide DIN enclosure
- CE compliant and ETL/cETL listed.

Model Number: PEXPDALIS

RS485



The Pharos RS485 Expansion Module allows the LPC to receive and generate RS485 serial command strings to facilitate interfacing to show control and user interface (wall station, touch panel) devices:

- Trigger one or more LPCs in response to command strings from RS485 devices.
- · Generate command strings to control RS485 devices.
- · Optically isolated transceiver suitable for harsh, industrial control environments.
- Half-duplex operation up to 500K baud.
- 3-pin 5.08mm plug-in rising clamp terminal.*
- 4 unit wide DIN enclosure.
- CE compliant and ETL/cETL listed.

Model Number: PEXPRS485

DMX INPUT

The Pharos DMX Input Expansion Module allows one or more LPCs to be controlled by any USITT DMX512 compatible system:

- · Configure one or more DMX channels as triggers or realtime variables for intensity or colour control.
- Augment an existing DMX installation with LED and automated lights.
- Optically isolated DMX512 transceiver, RDM compatible.
- 3-pin 5.08mm plug-in rising clamp terminal.* 4 unit wide DIN enclosure.
- CE compliant and ETL/cETL listed.
- Model Number: PEXPDMXIN



North American Distributor

3031 Pleasant View Road, PO Box 620979, Middleton WI 53562 0979 USA • Tel +1 608 831 4116 • Fax +1 608 836 1736 • www.etcarchitectural.com/pharos

Architectural Copyright © 2004-6 Pharos Architectural Controls Limited. All rights reserved. Specifications subject to change without notice (15-08-2006).





SHEPHERDS BUILDING, ROCKLEY ROAD, LONDON W14 0DA, UNITED KINGDOM www.pharoscontrols.com

TIMECODE



The Pharos Timecode Expansion Module reads all Linear Time Code (LTC) formats allowing a presentation to be synchronised with audio-visual or show control equipment:

- 24fps (film), 25fps (PAL/EBU), 29.97fps (NTSC) & 30fps (SMPTE).
- · Balanced line level audio input for improved noise immunity.
- Jumps, slow- and fast-code support in either play direction.
- · Software "fly-wheel" and error correction routines.
- 3-pin 5.08mm plug-in rising clamp terminal.*
- · 4 unit wide DIN enclosure.
- CE compliant and ETL/cETL listed.

Model Number: PEXPTIME

AUDIO



Realise the power and flexibility of the LPC's playback engine with the Audio Expansion Module which allows realtime manipulation of intensity, colour and timeline playback to create sophisticated sound-to-light or "light organ" effects:

- 5-band spectrum analysis: 63Hz, 250Hz, 1KHz, 3.5KHz & 12KHz.
- · Balanced line level audio input, software adjustable gain.
- · Use two modules for stereo applications.
- 3-pin 5.08mm plug-in rising clamp terminal.*
- 4 unit wide DIN enclosure.
- CE compliant and ETL/cETL listed.

Model Number: PEXPAUDIO

LONWORKS

Lonworks is a popular building management system and the Pharos Lonworks Expansion Module allows one or more LPCs to be managed over a Lonworks network:

- Echelon Corporation Lonworks TP/FT-10 topology.
- · Complies with ANSI/EIA 709.1 Control Networking Standard.
- Integrate with building management systems as a scene controller.
- · Compatible with ETC's SmartLink product range.
- 3-pin 5.08mm plug-in rising clamp terminal.*
- 4 unit wide DIN enclosure.

FUTURE DEVELOPMENT

* Camden Electronics CTB9208/3 (supplied).

OEM EXPANSION MODULES & SOFTWARE DRIVERS

While the Pharos LPC and Expansion Module range covers a wide variety of open-architecture communication protocols and established triggering standards it is envisaged that particular manufacturers, installations or projects may require additional interfacing solutions.

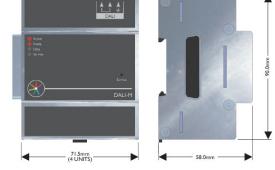
Some examples are given below, please enquire regarding your specific requirements:

Communication protocols:

- Artnet.
- Pathport.
- · ACN.
- ETC Net2.
- Proprietary protocols (with agreement).
- Telemetry solutions, for example SMS Text or GPRS.

Interfaces:

- · CAN.
- Analog inputs, relay outputs.





North American Distributor

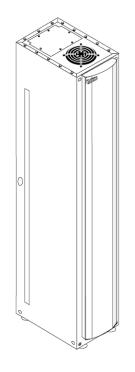
3031 Pleasant View Road, PO Box 620979, Middleton WI 53562 0979 USA • Tel +1 608 831 4116 • Fax +1 608 836 1736 • www.etcarchitectural.com/pharos 4220L1002 Rev. C Printed

Architectural

Copyright © 2004-6 Pharos Architectural Controls Limited. All rights reserved. Specifications subject to change without notice (15-08-2006).

Sensor+ Standard Series





GENERAL INFORMATION

Sensor+ dimming systems provide high density, professional features and exceptional reliability for lighting applications that require the best the entertainment industry can offer.

APPLICATIONS	Professional and educational theatre
	Production studios
	Concert and performance halls
	Themed retail and dining
	Multi-use Convention Centers
	Houses of Worship
FEATURES	High dimmer density
	Up to two 2.4kW dimmers per module
	6, 12, 24, and 48 module racks available
	Rugged industrial construction
	Installation flexibility
	Adaptable modular design
	100,000A Short Circuit Current Rating (SCCR)
	Advanced configuration editing built into rack
	Stores up to 128 Presets in memory
	Direct Ethernet control signal input
	Two DMX512 inputs
	Standard system and rack monitoring with diagnostic reporting
	Supports ETC Dimmer Doubling™
	All racks UL and cUL LISTED
ACCESSORIES	SmartLink Button Stations
	Dimmer Doubler
	Sound Suppression Hood
	Floor pedestal for 24-module rack
	Document holder

ORDERING INFORMATION

Installation Racks

Model#	Description
SR6+	Sensor+ 6 Module Rack
SR12+	Sensor+ 12 Module Rack
SR24+	Sensor+ 24 Module Rack
SR48+	Sensor+ 48 Module Rack
SR6+1P	Sensor+ 6 Module Single Phase Rack
SR12+1P	Sensor+ 12 Module Single Phase Rack
SR24+1P	Sensor+ 24 Module Single Phase Rack

Rack Options*

Model#	Description	
AT12	Amp-Trap [®] fuse option for 12-module rack	
AT24	Amp-Trap fuse option for 24-module rack	
AT48	Amp-Trap fuse option for 48-module rack	
BK12	Bussing kit for 2 — 12-module racks	
BK24	Bussing kit for 2 – 24-module racks	
BK48	Bussing kit for 2 — 48-module racks	
AUX19-12	19" Auxiliary Rack(s) for 12-module rack	
AUX19-24	19" Auxiliary Rack(s) for 24-module rack	
AUX12-48	12" Auxiliary Rack(s) for 48-module rack	
AUX19-48	19" Auxiliary Rack(s) for 48-module rack	
AUX30-48	30" Auxiliary Rack(s) for 48-module rack	
*Vibration Reduction mounts available for all Sensor+ rack.		

Contact ETC for details

Rack Accessories

Model#	Description
SSSh 6-12	Sensor+ Sound Suppression Hood — small
SSSh 24-48	Sensor+ Sound Suppression Hood — large
Pedestal	Floor pedestal for 24-module rack
DH	Document holder

SmartLink Accessories 🖅

Model#	Description	
S-LPB	SmartLink Power Board for Sensor+ Racks*	
S-10005	SmartLink 5-button Station*	
S-10010	SmartLink 10-button Station	
*One SmartLink Power Roard required for station support. S-LPR supports up to		

*One SmartLink Power Board required for station support. S-LPB supports up to four stations. Only one S-LPB or S-LPS may be enabled in a system.



SPECIFICATIONS

GENERAL	Racks available in four sizes SR6+ 6 modules, 12 dimmers maximum SR12+ 12 modules, 24 dimmers maximum SR24+ 24 modules, 48 dimmers maximum SR48+ 48 modules, 96 dimmers maximum
	Dual density (two dimmers per module), single density and half density dimmer modules available
	Operating temperature: 0-40°C / 32-104°F Dimmer room HVAC systems must at all times maintain the specified ambient temperature at the dimmer rack. Dimming systems operating within 10 degrees F of the upper or lower temperature limits must strictly follow installation and operation guidelines to operate reliably.
	Relative humidity: 30-90% non-condensing
	All racks UL and cUL LISTED
	UL924 LISTED for Bypass operation
MECHANICAL	Rugged 16-gauge steel construction
	Fine-textured, scratch-resistant, epoxy paint
	SR6+ and SR12+ uses wall mount installation
	SR24+ can be wall or pedestal mounted
	SR48+ is floor mounted
	Top and bottom conduit access through removable panels (SR48+) or knockouts (SR6+, SR12+, and SR24+)
	No tools required for module removal or installation
	Keyed module slots prevent insertion of inappropriate module types
	Front access to all wiring and terminations
	Full height locking door
	Electrostatic air filter easily removed from door for periodic cleaning
	High efficiency cooling system with airflow sensor
	High visibility LED status beacon
ELECTRICAL	SR6+, SR12+ and SR24+ accept: Three phase 120/208 VAC Single phase 120/240 VAC
	SR48+ accepts
	Three phase 120/208 VAC
	Line feed frequencies from 47-63Hz
	Line feed voltage range is 90-140 VAC Load terminals accept up to #4 AWG (16mm²)
	wire (see chart)
	Short Circuit Current Rating: 100,000A RMS symmetrical @240VAC
	Auxiliary Equipment Racks and custom switchgear/distribution available (Call ETC for details)
CONTROL	Sensor+ Control Electronics Module (CEM+)
ELECTRONICS	Single Ethernet control signal input Two DMX512 inputs
	Standard diagnostic reporting via browser-based interface
	Supports Dimmer Doubling™
	Supports SmartLink control of presets
OPTIONS	Advanced Features [™] dimmer-specific load and diagnostic reporting
	Amp-Trap® fuses to allow feeding individual racks from oversize mains
	All-copper bus kits available
	Vibration reduction kits available for all racks SmartLink Power Board

ORDERING INFORMATION

Dimmer Modules

Standard Sensor Modules		
Model#	Description	
D15	Dual 15A Dimmer Module – 350µS	
D20	Dual 20A Dimmer Module – 350µS	
D15E	Dual 15A Dimmer Module – 500µS	
D20E	Dual 20A Dimmer Module – 500µS	
D50AF	Single 50A Dimmer Module – 500µS	
	– Advanced Features	
D100AF*	Half 100A Dimmer Module – 500µS	
	– Advanced Features	
Special Purpose Sensor	Modules	
Model#	Description	
L10	Dual 10A Low Wattage Dimmer Module	
L10F	Single 10A Low Wattage Fluorescent	
	Dimmer Module	
D15F	Single 15A Fluorescent Dimmer Module	
D20F	Single 20A Fluorescent Dimmer Module	
R15AF	Dual 15A Relay Module – Advanced Features	
R20AF	Dual 20A Relay Module – Advanced Features	
CC15	Dual 15A Constant Circuit Breaker Module	
CC20	Dual 20A Constant Circuit Breaker Module	
AFM	Air Flow Module	

*Half-density modules use two module slots

Control Modules

Model#	Description
CEM+	Control Electronics Module +

WIRING CHARTS

Load Wiring Lug Capacity

Connection	Wire Size
10A, 15A, 20A, and 50A lugs	4 AWG Max. (16mm ²)
100A lugs	2/0 Max.

Primary Feed Lug Capacity

Connection	Wire Size
SR6+	Single 2/0 – 14 AWG
SR12+	Dual 250 kcmil – 6 AWG
SR24+	Dual 350 kcmil – 4 AWG
SR48+	Dual 600 kcmil – 2 AWG

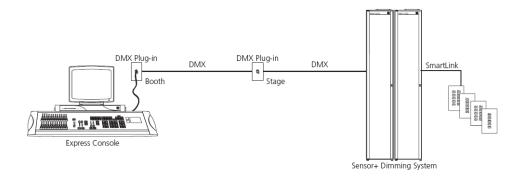
RACK DIMENSIONS

Installation Rack dimensions

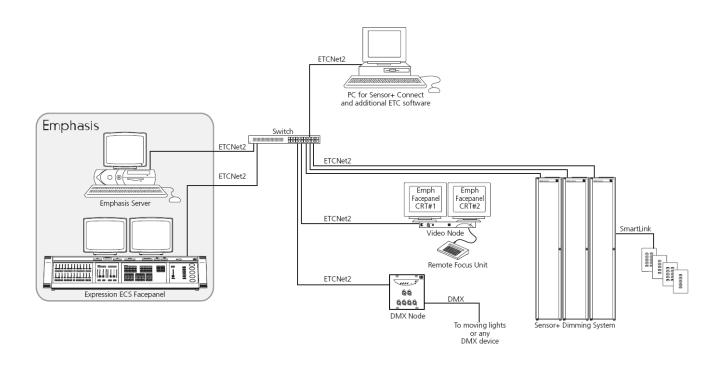
Model	Height		Width		Depth	
	inches	mm	inches	mm	inches	mm
SR6+	16.4	420	14.6	370	13.3	340
SR12+	25.8	660	14.6	370	13.3	340
SR24+	45.8	1160	14.6	370	16.8	430
SR48+	83.1	2110	14.6	370	22.8	580

Sensor+ Standard Series

TYPICAL DMX SYSTEM RISER DIAGRAM

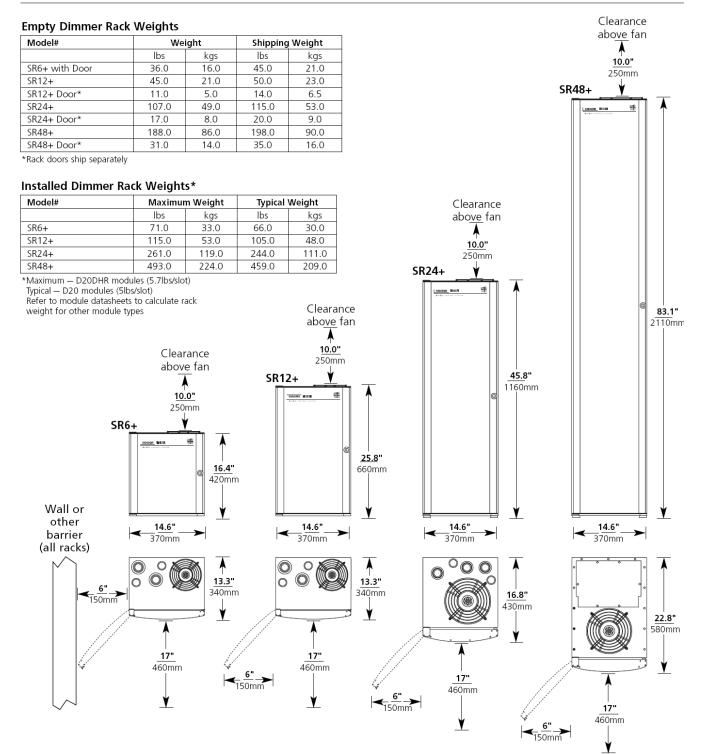


TYPICAL NETWORK SYSTEM RISER DIAGRAM



Sensor+ Standard Series

PHYSICAL





Corporate Headquarters = 3031 Pleasant View Rd, PO Box 620979, Middleton WI 53562 0979 USA = Tel +1 608 831 4116 = Fax +1 608 836 1736 London, UK = Unit 26-28, Victoria Industrial Estate, Victoria Road, London W3 6UU, UK = Tel +44 (0)20 8896 1000 = Fax +44 (0)20 8896 2000 Rome, IT = Via Ennio Quirino Visconti, 11, 00193 Rome, Italy = Tel +39 (06) 32 111 683 = Fax +39 (06) 32 656 990 Holzkirchen, DE = Ohmstrasse 3, 83607 Holzkirchen, Germany = Tel +49 (80 24) 47 00-0 = Fax +49 (80 24) 47 00-3 00 Hong Kong = Room 605-606, Tower III Enterprise Square, 9 Sheung Yue Road, Kowloon Bay, Kowloon, Hong Kong = Tel +852 2799 1220 = Fax +852 2799 9325 Web = www.etcconnect.com = Copyright © 2006 ETC. All Rights Reserved. All product information and specifications subject to change. 7151L1001 Rev. C Printed in USA 01/06

Sensor® products protected by U.S. Patent Numbers 5,323,088, 5,352,958 and 6,002,563; European Number 060333372; German Number 69203609; US and International Patents Pending.

1.02 DIMMER RACK

- A. General
 - 1. The installation rack shall be the Sensor+ as manufactured by Electronic Theatre Controls, Inc., or equal. The fully digital dimmer rack shall consist of up to 48 dimmer module spaces. Sensor rack systems shall be UL Listed and CSA Approved, and shall be so labeled when delivered to job site.
- B. Electrical
 - 1. Sensor racks shall operate at up to 120/208V, three phase, four wire + ground, 47 to 63 Hz at 800 amps max. Provisions shall be made for optional amp trap devices for fault current protection. Standard AIC fault current protection shall be 100,000.
 - 2. All load and neutral terminals shall accept up to a #2 AWG wire.
- C. Electronics
 - 1. Dimmer control electronics shall be contained in one plug-in Control Electronics Module (CEM+). Each CEM+ shall contain no discrete wire connections, and be housed in a formed steel body with an injection-molded face panel.
- D. Physical
 - 1. The Sensor dimmer rack shall be a freestanding, deadfront switchboard, substantially framed and enclosed with 16-gauge, formed steel panels. All rack components shall be properly treated, primed and finished. Exterior surfaces shall be finished in fine texture, scratch resistant, gray epoxy paint. Removable top and bottom panels shall facilitate conduit termination on the 48-module rack. Knockouts shall serve the same purpose on 12 and 24 module racks.
 - 2. Sensor racks shall be available in four sizes, with the following dimensions.

a.	SR6+ (6 module)	16.6" H x 14.8" W x 13.3" D
b.	SR12+ (12 module)	25.8" H x 14.8" W x 13.3" D
c.	SR24+ (24 module)	45.8" H x 14.8" W x 16.8" D
d.	SR48+ (48 module)	83.1" H x 14.8" W x 22.8" D

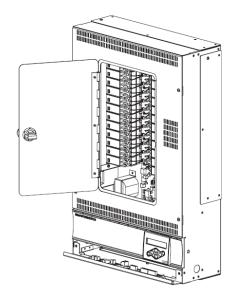
- 3. Racks shall be designed for front access to allow back-to-back or side-by-side installation.
- 4. Racks shall be designed to allow easy insertion and removal of all modules without the use of tools. Supports shall be provided for precise alignment of dimmer modules into power and signal connector blocks. With modules removed, racks shall provide clear front access to all load, neutral and control terminations. Racks that require removable panels to access load, neutral or control terminations shall not be acceptable.
- 5. An optional bus bar kit shall be available from the factory to allow adjacent racks to be powered by a single line feed. No hard, rack-to-rack wiring shall be required. Racks that require discrete cabling to connect adjacent racks shall not be acceptable.
- 6. Module spaces shall be mechanically keyed to accept only the module type (20A, 50A or 100A) specified for that space. Racks that allow modules of varying wattages to plug into the same space shall not be acceptable. The rack shall be configurable to accept mixed dimmer types and sizes throughout the rack.
- 7. Each rack shall provide a lockable full-height door containing an integral electrostatic air filter that shall be removable for easy cleaning. A single low-noise fan shall be located at

the top of each rack. The fan shall draw all intake air through the integral electrostatic air filter, over the surfaces of the module housing and out the top of the rack. The fan shall maintain the temperature of all components at proper operating levels with dimmers under full load, provided the ambient temperature of the dimmer room does not exceed 40°C/104°F. Dimmer racks that do not employ both locking doors and electrostatic air filters shall not be acceptable. The fan shall turn on whenever any dimmer in the system is activated. In the event of an over-temperature condition, only the affected dimmer module(s) shall shut down and a message shall appear on the control module LCD. The fan shall remain on during thermal shutdown of individual dimmer modules.

- 8. An airflow sensor shall be provided. In the event of inadequate airflow, the affected rack shall shut down until the error is corrected.
- If the ambient room temperature drops below 0°C/32°F or rises above 40°C/104°F, a warning shall appear on the dimmer rack LCD. If the temperature rises above 46°C/115° F, the rack shall shut down until the condition is corrected.
- 10. A 3 x .5-inch LED status indicator (beacon) shall be mounted in the rack door. The beacon shall be visible throughout a wide viewing angle. In normal operation conditions, this LED is illuminated. If the rack's control module senses an error condition, the beacon shall flash until the error is corrected. An optional indicator shall be available for remote locations.

Smart Solutions Series

Smartink E



GENERAL INFORMATION

Controlling switched circuits is as simple as SmartSwitch, ETC's relay panel. SmartSwitch can be operated stand alone, with SmartLink, or DMX-controlled from another source. Designed to combine with matching SmartPack Wallmount dimming, SmartSwitch completes a budgetoriented control system.

SmartSwitch comes standard with SmartLink control. When used with the optional LinkPower Supply, the system allows up to four SmartLink Stations to be connected for remote operation of presets and sequences.

APPLICATIONS	Ballrooms
	Restaurants
	Churches
	Small performance spaces
	Multi-purpose rooms
	Entertainment facilities with DMX control
PERFORMANCE	Safe and reliable operation
	Switches relays all at once or variable delay
	SmartLink, DMX-512 or Stand-Alone Control
	Built-in presets and sequencer
FEATURES	Up to 24 Aromat relays per panel
	Mechanically latching relays
	Single-space, single or double pole relays
	120v to 277v switching and control input
	20-amp rated contacts switch with no derating
	Manual ON/OFF lever with indicator on relay
	Relays can be added in the field
	Voltage barrier for discrete relay power feeds
	Optional LinkPower Supply for stations
	UL-924 listed emergency contact input
	Matches SmartPack Wallmount dimming
	Common programming with SmartPack
	Full compliance with UL, cUL, and FCC regulations

ORDERING INFORMATION

Standard SmartSwitch Relay Units

Model#	Description	
SS-121P-LPS	SmartSwitch 12 - 20A Single Pole Relays with	
	LinkPower Supply	
SS-121P	12 - 20A Single Pole Relays	
SS-241P-LPS	24 - 20A Single Pole Relays with	
	LinkPower Supply	
SS-241P	24 - 20A Single Pole Relays	

No-Standard Model Numbering

	Qty	Single Pole	/	Qty	Double Pole	LinkPower		
SS-	#	1P	/	#	2P	LPS		

SmartSwitch (SS) – followed by the number of 1P relays, a forward slash, and then the number of 2P relays. Examples:

SS-61P/62P – Six 20A Single Pole relays and six 20A Double Pole relays

SS-21P/102P – Two 20A Single Pole relays and ten 20A Double Pole relays

SS-121P/122P-LPS – Twelve 20A Single Pole Relays, Twelve 20A

Double Pole Relays, and internal LinkPower Supply

SmartSwitch Accessories

SS-1PRK	Single Pole Relay Kit	
SS-2PRK	Double Pole Relay Kit	
SS-RMK	19" Rack Mount Kit for SmartSwitch	
SS-VB	SmartSwitch Voltage Barrier Kit	

SmartLink Accessories

S-10005	SmartLink 5-Button Station*		
S-10010	SmartLink 10-Button Station*		
S-LPS	LinkPower Supply Kit		
*Stations require one LinkPower Supply per system			

Only one LinkPower Supply allowed per system Four stations supported



Smart Solutions Series

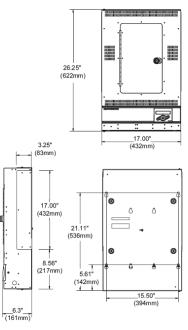
SPECIFICA	ATION S
GENERAL	Approvals and Certifications:
	Underwriters Laboratories tested and listed to the following standards:
	UL508 (File: E92154)
	Complies with ESTA DMX512-A Standard
FEATURES	SmartLink control for presets, and Sequence
	Optional LinkPower Supply powers four stations
	Advanced DMX control of relays:
	Selectable threshold level for on/off
	DMX addressing via keypad
	Soft patch any relay to any DMX channel
	Internal DMX termination switch
	DMX loss and power-up behavior
	32 programmable presets
	Sequencer with programmable times
	Switch all relays at once or select 0.5 to 60 second delay between relays (0.1s steps)
	UL924-listed contact input instantly switches selected relays on, while switching others off
	Multi-lingual interface – English, French, German and Spanish
USER	High-contrast 20-character by 2-line backlit LCD
INTERFACE	6-button menu-navigation keypad
	Power status indicator LED (blue)
	DMX status indicator LED (green)
	On/off status indicator for each relay
MECHANICAL	Panel consists of enclosure, cover with locking door, and internal sub-panel
	ENCLOSURE:16-gauge steel construction
	Black, fine-textured, scratch-resistant paint
	Removable conduit panels on top, bottom and sides
	Full front access (side clearance not required)
	Optional 19" rack mount kit (requires 15u spacing)
	COVER & DOOR: Removable cover allows access to all AC and Class 2 wiring
	Locking door allows controlled access to manual switch of each relay and Class 2 wiring only
	SUB-PANEL: Removable sub-panel containing the electronics and relays can ship separately – contact ETC
	All low-voltage wiring is physically separated from AC by a mechanical barrier
ELECTRICAL	Single panel for up to 24 relays, populated in any combination of single-space, single or double pole
	Separate chambers for Class 1 and Class 2 wiring
	Optional Voltage Barriers install without tools between any relay for partioning between multiple voltages and/or Emergency circuits

CONTROL	Input: 120	√ or 277V (+/- 15%), 60Hz, >8 amps			
ELECTRONICS	Dual-tap transformer primary screw terminals accept up to 12AWG wire				
CONTROL	Easy-access	s flip-down door for all control wiring			
WIRING	Removable terminals for DMX512, SmartLink and UL924-listed Emergency Contact Input				
	Control ter	minals accept maximum of 12AWG wire			
	All control wiring exiting the enclosure is Class 2 – limited energy				
RELAYS	20A 300V General Purpose				
RATINGS	20A 300V Ballast (HID)				
	2400W Tungsten @120V				
	0.5 HP @ 120V Motor Load				
	1.5 HP @ 2	40/277 Motor Load			
	SSCR:	5,000A@ 120V and 277V			
	Inrush:	2000A			
	Isolation:	2,500V RMS			
	State:	Latching			
	Life:	60,000 cycles at full load			
	Terminal:	Accepts 12-14AWG copper wire			
THERMAL	Ambient operation temperature between 0°C (32°F) and 45°C (104°F)				
	Humidity between 10-90% (non-condensing)				
	Convection cooled				

PHYSICAL

SmartSwitch Dimensions

Model	Height		del Height Width		Depth		Weight	
	inches	mm	inches	mm	inches	mm	lbs	kg
SS-121P	26.25	622	17.00	432	6.3	161	29.80	13.51
SS-241P	26.25	622	17.00	432	6.3	161	44.75	20.29





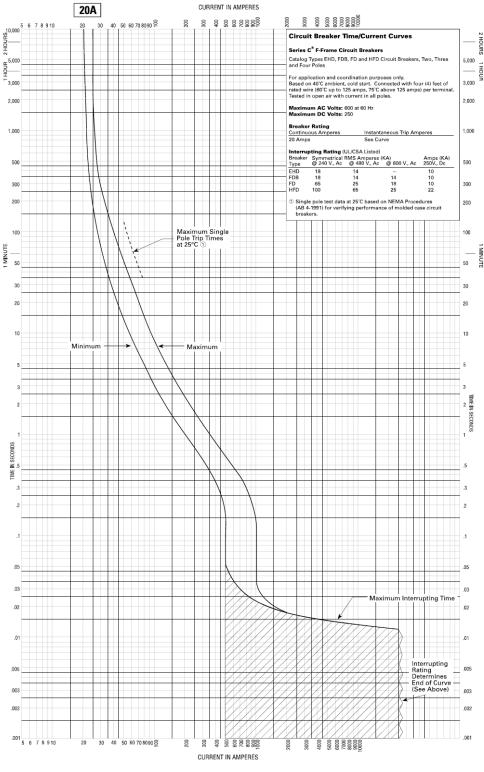
Corporate Headquarters = 3031 Pleasant View Rd, PO Box 620979, Middleton WI 53562 0979 USA = Tel +1 608 831 4116 = Fax +1 608 836 1736 London, UK = Unit 26-28, Victoria Industrial Estate, Victoria Road, London W3 6UU, UK = Tel +44 (0)20 8896 1000 = Fax +44 (0)20 8896 2000 Rome, IT = Via Ennio Quirino Visconti, 11, 00193 Rome, Italy = Tel +39 (06) 32 1116 83 = Fax +39 (06) 32 656 990 Holzkirchen, DE = Ohmstrasse 3, 83607 Holzkirchen, Germany = Tel +49 (80 24) 47 00-0 = Fax +49 (80 24) 47 00-3 00 Hong Kong = Room 605-606, Tower III Enterprise Square, 9 Sheung Yuet Road, Kowloon Bay, Kowloon, Hong Kong = Tel +852 2799 1220 = Fax +852 2799 9325 Web = www.etcconnect.com = Copyright © 2005 ETC. All Rights Reserved. All product information and specifications subject to change. 7023L1001 Rev. A Printed in USA 08/05

Device Coordination Study

AB DE-ION Circuit Breakers

2 HOURS

1 HOUR

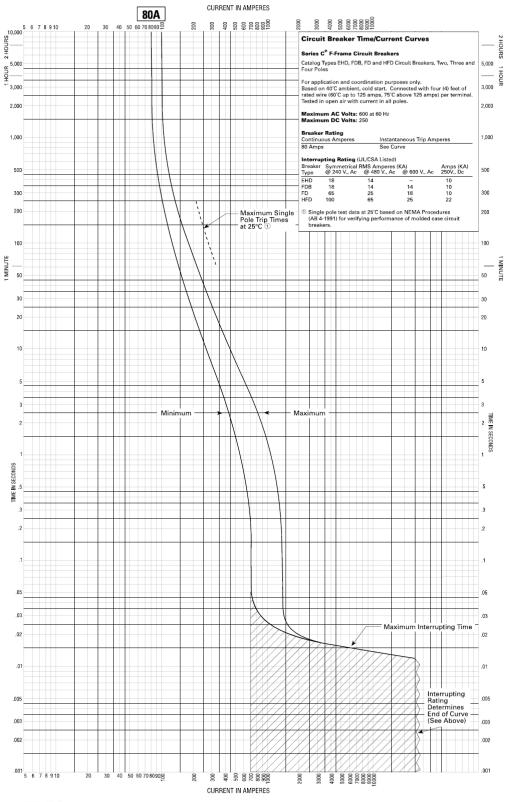


Types EHD, FDB, FD and HFD 20 Amperes

Curve No. SC-4135-87B F-T-N

AB DE-ION Circuit Breakers

Types EHD, FDB, FD and HFD 80 Amperes



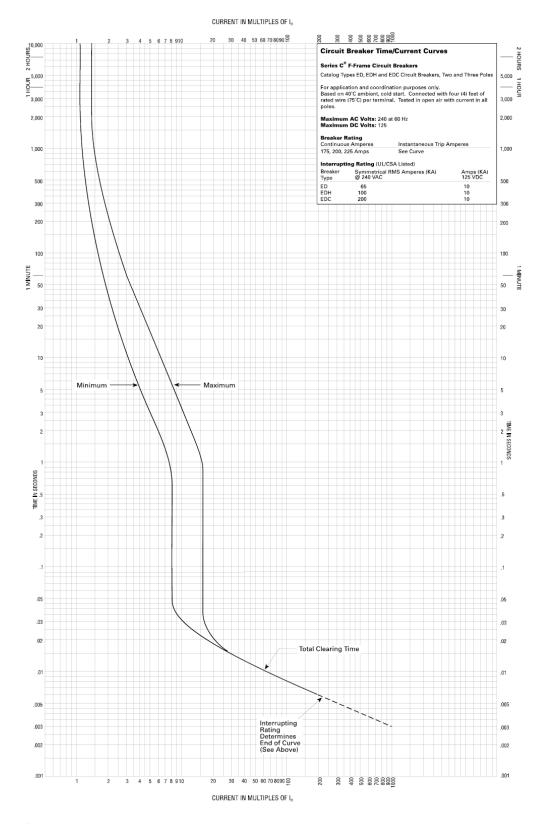
Curve No. SC-4144-87B



October 1997

AB DE-ION Circuit Breakers

Types ED, EDH and EDC 225 Amperes

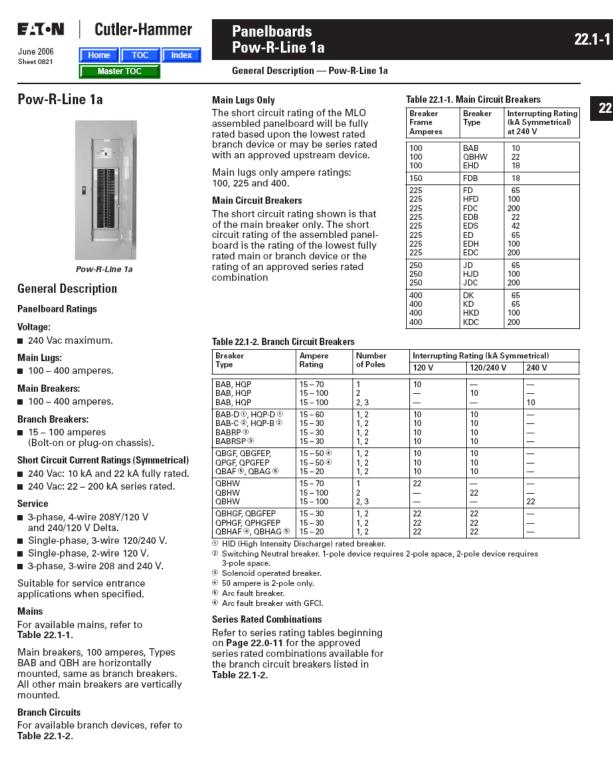


Curve No. SC-5805-94A **FAT+N**

October 1997

Appendix B-1

Panelboards M3, L5, L6, E



22.1-2 Panelboards Pow-R-Line 1a

Technical Data — Pow-R-Line 1a

22

Pow-R-Line 1a Specifications

Bussing

100 – 400 amperes: Tin-plated aluminum is standard, copper is available as an option.

Boxes

Boxes are made from code-gauge galvanized steel.

Blank ends are supplied as standard, knockouts are available upon request.

EZ Trim

Trims are made from code-gauge steel and painted ANSI 61 gray.

All panelboards have door-in-door as standard with multi-point catch and lock, and concealed mounting hardware.

Modifications

Table 22.1-3. Sub-Feed Lugs (Main Lugs Only)

Amperes	Panel Height Addition		
	0 Inches (0 mm) 0 Inches (0 mm)		

Table 22.1-4. Through-Feed Lugs

Amperes	Information
100	See Table 22.1-6
225	See Table 22.1-6
400	See Table 22.1-6

Table 22.1-5. Sub-Feed Breakers (One Per Panel)

Ampere Rating	Breaker Type	Interrupting Rating (kA Symmetrical) at 240 V
150	FDB	18
225 225 225 225 225 225 225 225 225 225	FD HFD FDC EDB EDS ED EDH EDC	65 100 200 22 42 65 100 200
250 250 250	NDC HID ND	65 100 200
400 400 400 400	DK KD HKD KDC	65 65 100 200

Shunt Trips

Shunt trips are available on breakers. BAB, HQP, QBHW and QPHW require one additional pole space for shunt trip, i.e., 1-pole is 2-pole size, 2-pole is 3-pole size and 3-pole is 4-pole size.

Ground Bar

Standard bolted in box. Aluminum is standard. Copper is available as an option.

Enclosures

Types 1, 12, 3R, 4 and 4X.

TVSS

Integrated onto panelboard chassis. For complete product description and available ratings, refer to **Section 36**.

Box Sizing and Selection

Box size for all Type 1 panelboards are available from **Table 22.1-6**.

Instructions

- Select the rating and type of mains required.
- Count total number of branch circuit poles (including spaces) required in the panelboard. Do not count main breaker poles. Convert 2- or 3-pole branch breakers to single-poles, i.e., 3-pole breaker, count as three poles.

Note: For horizontal mounted mains (BAB Type), use main lug table, include space in branch section for mains.

E-T-N Cutler-Hammer

Home TOC Index June 2006 Sheet 0822

 Using correct table, type of mains and ampere rating per Step 1, find total number of poles.

Note: Where total number of poles (Step 2) fall between number in table, use the next higher number.

 Read box size across columns to the right.

Top and Bottom Gutters (minimum)

5-1/2 inches (139.7 mm).

Side Gutters

20-inch (508.0 mm) wide box: 6-1/2 inches (165.1 mm).

Table 22.1-6. Type 1 Panelboards — Dimensions in Inches (mm)

Ampere	Main Breaker Type		Maximum	Box Dimens	sions 🔍	
Rating of Mains	Mounting Position		Number of Branch Circuits Including Provisions	Height	Width	Depth
100 Amperes						
100 A Main Lugs or Main Breaker	EHD, FDB, FD, HFD, FDC Vertical		18 30 42 48	36 (914.4) 48 (1219.2) 48 (1219.2) 60 (1524.0)	20 (508.0) 20 (508.0) 20 (508.0) 20 (508.0) 20 (508.0)	5.75 (146.1) 5.75 (146.1) 5.75 (146.1) 5.75 (146.1)
100 A Main Lugs or Main Breaker with 100 A Through-Feed Lugs or Sub-Feed Breaker	EHD, FDB, FD, HFD, FDC Vertical		18 30 42 48	48 (1219.2) 48 (1219.2) 60 (1524.0) 60 (1524.0)	20 (508.0) 20 (508.0) 20 (508.0) 20 (508.0) 20 (508.0)	5.75 (146.1) 5.75 (146.1) 5.75 (146.1) 5.75 (146.1) 5.75 (146.1)
225 Amperes						
225 A	EDB, EDS, ED, EDH, EDC, FD, HFD, FDC Vertical		18 30 42 48	36 (914.4) 48 (1219.2) 48 (1219.2) 60 (1524.0)	20 (508.0) 20 (508.0) 20 (508.0) 20 (508.0)	5.75 (146.1) 5.75 (146.1) 5.75 (146.1) 5.75 (146.1)
225 A Main Lugs or Main Breaker with 225 A or 100 A Sub-Feed Lugs or Breaker	EHD, FDB, FD, I FDC, EDB, EDS ED, EDH, EDC Vertical		18 30 42 48	48 (1219.2) 48 (1219.2) 60 (1524.0) 60 (1524.0)	20 (508.0) 20 (508.0) 20 (508.0) 20 (508.0) 20 (508.0)	5.75 (146.1) 5.75 (146.1) 5.75 (146.1) 5.75 (146.1) 5.75 (146.1)
400 Amperes						
400 A Main Lugs or Main Breaker	DK, KD, HKD, KDC Vertical		18 30 42 48	60 (1524.0) 60 (1524.0) 72 (1828.8) 72 (1828.8)	20 (508.0) 20 (508.0) 20 (508.0) 20 (508.0)	5.75 (146.1) 5.75 (146.1) 5.75 (146.1) 5.75 (146.1)
400 A Main Lugs or Main Breaker with 225 A	DK, KD, HKD, KDC Vertical	Mains	18 30 42	60 (1524.0) 72 (1828.8) 72 (1828.8)	20 (508.0) 20 (508.0) 20 (508.0)	5.75 (146.1) 5.75 (146.1) 5.75 (146.1)
or 100 A Sub-Feed Lugs or Breaker	EHD, FDB, FD, HFD, FDC, EDB, EDS, ED, EDH, EDC Vertical	Sub- Feed Breakers	48	90 (2286.0)	20 (508.0)	5.75 (146.1)

Smaller panelboard box sizes are available if required. Contact Eaton for application information.

2 Add 8 inches (203.2 mm) for TVSS.

I For horizontal mounted mains (BAB Type), use main lug table, include space in branch

section for mains.

④ JD, HJD, JDC is same space requirement as 400 ampere DK, HKD, KDC.



LIGHTING PLAYBACK CONTROLLERS

SHEPHERDS BUILDING, ROCKLEY ROAD, LONDON W14 0DA, UNITED KINGDOM www.pharoscontrols.com

OVERVIEW

The Pharos control solution has two complementary parts: a Lighting Playback Controller (LPC) which forms a permanent part of the installation, and the Designer software which runs on any personal computer and is only required when creating or modifying the lighting presentation.

Many playback controllers for lighting installations store the show as frames of control data and so playback consists of outputting these frames in sequence. However this is a very limited way to control lighting. Because the show data is stored in such a raw form it takes up a lot of memory and that imposes limits on the length of the show. Furthermore it can only reproduce its output exactly as programmed every time, which means that there is no ability to separate the lighting into multiple zones with discrete intensity control or provide interactive triggering beyond a simple start and stop.

The Pharos Lighting Playback Controllers are intended to be price-competitive with these framestore solutions but offer genuine lighting control functionality. Lighting is programmed on timelines with a particular timeline having control data for one, some or all the lighting fixtures being controlled. Multiple timelines are supported and so a single unit can control multiple distinct zones, or more complex presentations can be programmed with external triggers coming from multiple systems.

The LPCs are provided in a compact DIN-rail compatible housing for mounting within an electrical cabinet, or alternatively they can be wall-mounted. For easy installation most connections are provided as plug-strips. The solid state design with efficient, embedded firmware ensures unparalleled reliability.

The extensive range of external triggering interfaces supported by the LPC includes Ethernet,RS232 serial, MIDI and digital inputs. Additional interfaces are supported by optional LPC Expansion Modules. Conditional logic, variables and scripts provide powerful show control functionality.

Multiple units can be used together for larger installations and synchronized automatically over Ethernet. The units have an internal web server with an active web page giving status and configuration information for remote monitoring, and either Ethernet or USB can be used to connect to the PC running the Designer software during programming.

VERSIONS

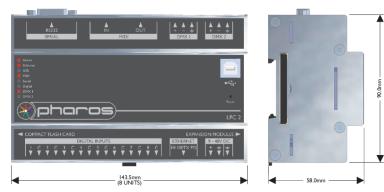
There are two versions of the Lighting Playback Controller:

- The LPC I is designed for smaller systems that can be controlled by a single standalone unit:
- One DMX512 output (up to 512 dimmers or 170 RGB colour-mixing units).
- Triggering via Ethernet, RS232 serial, MIDI and digital inputs.
- · Realtime clock with sunrise and sunset functions.
- Supports Expansion Modules for other protocols and interfaces. Model Number: PLPC1

The **LPC 2** is designed for larger systems and has the ability to synchronise itself with other LPC 2 units during playback making it a scalable solution:

- Two DMX512 outputs (up to 1024 dimmers or 340 RGB colour-mixing units).
- Triggering, realtime clock and Expansion Module support as the LPC I.
- Multiple units can be linked via Ethernet and will automatically synchronise playback and share triggers across the network.

Model Number: PLPC2





SPECIFICATIONS

General:

- Microprocessor based system specifically designed for the control of lighting in an architectural or entertainment application.
- Project data stored in non-volatile solid-state memory (Compact Flash Card), uploaded from a remote personal computer over an Ethernet, USB or web connection.
- Operating System stored in non-volatile solid-state memory, remotely updated when necessary from a personal computer over an Ethernet or USB connection.
- Commences playback automatically on receiving power without additional external trigger.
- without additional external trigger.
- Internal realtime clock operates when power is absent.
 Supports multiple LPC Expansion Modules for other interfaces and protocols, including RS485, audio, timecode and
- Interfaces and protocols, including R5485, audio, timecode and DALI.
- · Integrated web server.

Physical:

- Enclosure and mounting complies with DIN43880 and
- EN60715 (35/7.5 rail) respectively.
- 8 unit wide DIN enclosure.
- Operating temperature range 0°C to 50°C (32°F to 122°F).
- CE compliant and ETL/cETL listed.

Electrical:

Supports the following wire terminations (Camden Electronics CTB9208 5.08mm plug-in rising clamp terminals, supplied):

- 9V to 48V DC power. *
- Isolated DMX512 ports, RDM compatible (2).
- Isolated digital inputs (8, tri-mode: active high, active low or contact closure).

In addition there are the following standard connectors:

- RJ45 socket for 10/100Base-TX Ethernet
- IEEE 802.3af PoE powered device.
- USB-B socket for USB 1.1.
- 9-pin D plug for isolated RS232 serial.
 5-pin DIN socket for MIDI In.
- 5-pin DIN socket for MIDI M.
 5-pin DIN socket for MIDI Out.
- 25-pin D socket for Expansion Modules only.
- * Unit may be powered either via DC input or PoE.



North American Distributor 3031 PleasantView Road, PO Box 620979, Middleton WI 53562 0979 USA • Tel +1 608 831 4116 • Fax +1 608 836 1736 • www.etcarchitectural.com/pharos

Copyright © 2004-6 Pharos Architectural Controls Limited. All rights reserved. Specifications subject to change without notice (15-08-2006)

Specification

LPC 1

A.General

- i. The Controller shall be a microprocessor-based system specifically designed for control of lighting in an architectural or entertainment application. A personal computer running emulation software shall not be acceptable.
- ii. The Controller shall store show data in non-volatile solid-state memory. This memory shall be removeable for purposes of backup or disaster-recovery.
- iii. Show data may be downloaded from a remote personal computer over an Ethernet or USB connection.
- iv. The Operating Software of the Controller shall be stored in a dedicated non-removeable non-volatile solid-state memory. It shall be possible to update the Operating Software by download from a remote personal computer over an Ethernet or USB connection.
- v. The Controller shall commence show playback automatically on receiving power without additional external inputs.
- vi. The Controller shall have an internal real-time clock that continues to operate when external power is absent.
- vii. The Controller shall have a capacity of 512 channels of DMX512 with RDM.
- viii. There shall be visual indicators on the Controller showing status of the controller and its interfaces.
- ix. The Controller shall operate a web server on its Ethernet interface. This shall allow status information and configuration options to be accessed remotely.
- x. The Controller shall allow lighting to be programmed as separate zones, with independent triggering and manual intensity control.
- xi. The Controller shall support multiple expansion modules for support of other interfaces or protocols, including Lonworks, DALI and SMPTE Timecode.
- xii. The Controller shall have a recessed switch for resetting the unit without removal of power.

B.Physical

- i. Enclosure and mounting shall comply with EN60715 (35/7.5) and DIN43880
- ii. The unit shall be an 8 unit DIN enclosure (143.5mm x 90.0mm x 58.0mm)
- iii. The unit shall operate in a temperature range from 0°C to 60°C (32°F to 140°F)

C.Electrical

i.

- The Controller shall be designed to support the following wire terminations (Camden Electronics CTB9208 5.08mm plug-in rising clamp terminals):
 - a. 9V to 48V DC Power
 - b. Isolated DMX512 Out, RDM-compatible (1)
 - c. Isolated Digital Inputs (8, tri-mode: active high, active low or contact closure)
- ii. In addition there shall be the following standard connectors:
 - a. RJ45 socket for 10/100Base-TX Ethernet
 - b. USB-B Socket for USB 1.1
 - c. 9-pin D socket for isolated RS232 serial
 - d. 5-pin DIN connector for MIDI In
 - e. 5-pin DIN connector for MIDI Out
 - f. 25-pin D socket for Expansion Modules
- iii. The Controller shall be able to receive power over ethernet as an alternative to direct DC power (IEEE 802.3af PoE powered device).



LPC EXPANSION MODULES

SHEPHERDS BUILDING, ROCKLEY ROAD, LONDON W14 0DA, UNITED KINGDOM www.pharoscontrols.com

OVERVIEW

The Pharos control solution incorporates a variety of LPC Expansion Modules that add support for other protocols and interfaces as required. Up to two Expansion Modules can be added to a single Lighting Playback Controller.

Our current range of modules is listed here and we are constantly developing solutions to support other protocols or proprietary systems:

DALI MASTER



DALI is a popular architectural lighting control protocol and the Pharos DALI Master Expansion Module allows a single LPC to control up to 128 DALI ballasts:

- DALI Master, complies with EN60929.
- Control up to 64 ballasts per module.
- Interrogate ballasts remotely via LPC web server.
- 3-pin 5.08mm plug-in rising clamp terminal.*
- 4 unit wide DIN enclosure.
- CE compliant and ETL/cETL listed.

Model Number: PEXPDALIM

DALI SLAVE

DALI is a popular architectural lighting control protocol and the Pharos DALI Slave Expansion Module allows one or more LPCs to be triggered by a DALI controller:

- DALI Slave or Ballast, complies with EN60929.
- Trigger LPC(s) from DALI controller or wall/touch panel.
- Interrogate LPC(s) for maintenance via DALI controller.
- · Augment an existing DALI installation with LED and automated lights.
- 3-pin 5.08mm plug-in rising clamp terminal.*
- 4 unit wide DIN enclosure
- CE compliant and ETL/cETL listed.

Model Number: PEXPDALIS

RS485



The Pharos RS485 Expansion Module allows the LPC to receive and generate RS485 serial command strings to facilitate interfacing to show control and user interface (wall station, touch panel) devices:

- Trigger one or more LPCs in response to command strings from RS485 devices.
- · Generate command strings to control RS485 devices.
- · Optically isolated transceiver suitable for harsh, industrial control environments.
- Half-duplex operation up to 500K baud.
- 3-pin 5.08mm plug-in rising clamp terminal.*
- 4 unit wide DIN enclosure.
- CE compliant and ETL/cETL listed.

Model Number: PEXPRS485

DMX INPUT

The Pharos DMX Input Expansion Module allows one or more LPCs to be controlled by any USITT DMX512 compatible system:

- · Configure one or more DMX channels as triggers or realtime variables for intensity or colour control.
- Augment an existing DMX installation with LED and automated lights.
- Optically isolated DMX512 transceiver, RDM compatible.
- 3-pin 5.08mm plug-in rising clamp terminal.* 4 unit wide DIN enclosure.
- CE compliant and ETL/cETL listed.
- Model Number: PEXPDMXIN



North American Distributor

3031 Pleasant View Road, PO Box 620979, Middleton WI 53562 0979 USA • Tel +1 608 831 4116 • Fax +1 608 836 1736 • www.etcarchitectural.com/pharos

Architectural Copyright © 2004-6 Pharos Architectural Controls Limited. All rights reserved. Specifications subject to change without notice (15-08-2006).





SHEPHERDS BUILDING, ROCKLEY ROAD, LONDON W14 0DA, UNITED KINGDOM www.pharoscontrols.com

TIMECODE



The Pharos Timecode Expansion Module reads all Linear Time Code (LTC) formats allowing a presentation to be synchronised with audio-visual or show control equipment:

- 24fps (film), 25fps (PAL/EBU), 29.97fps (NTSC) & 30fps (SMPTE).
- · Balanced line level audio input for improved noise immunity.
- Jumps, slow- and fast-code support in either play direction.
- · Software "fly-wheel" and error correction routines.
- 3-pin 5.08mm plug-in rising clamp terminal.*
- · 4 unit wide DIN enclosure.
- CE compliant and ETL/cETL listed.

Model Number: PEXPTIME

AUDIO



Realise the power and flexibility of the LPC's playback engine with the Audio Expansion Module which allows realtime manipulation of intensity, colour and timeline playback to create sophisticated sound-to-light or "light organ" effects:

- 5-band spectrum analysis: 63Hz, 250Hz, 1KHz, 3.5KHz & 12KHz.
- · Balanced line level audio input, software adjustable gain.
- · Use two modules for stereo applications.
- 3-pin 5.08mm plug-in rising clamp terminal.*
- 4 unit wide DIN enclosure.
- CE compliant and ETL/cETL listed.

Model Number: PEXPAUDIO

LONWORKS

Lonworks is a popular building management system and the Pharos Lonworks Expansion Module allows one or more LPCs to be managed over a Lonworks network:

- Echelon Corporation Lonworks TP/FT-10 topology.
- · Complies with ANSI/EIA 709.1 Control Networking Standard.
- Integrate with building management systems as a scene controller.
- · Compatible with ETC's SmartLink product range.
- 3-pin 5.08mm plug-in rising clamp terminal.*
- 4 unit wide DIN enclosure.

FUTURE DEVELOPMENT

* Camden Electronics CTB9208/3 (supplied).

OEM EXPANSION MODULES & SOFTWARE DRIVERS

While the Pharos LPC and Expansion Module range covers a wide variety of open-architecture communication protocols and established triggering standards it is envisaged that particular manufacturers, installations or projects may require additional interfacing solutions.

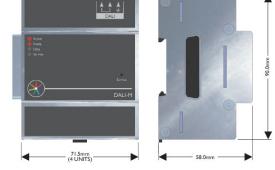
Some examples are given below, please enquire regarding your specific requirements:

Communication protocols:

- Artnet.
- Pathport.
- · ACN.
- ETC Net2.
- Proprietary protocols (with agreement).
- Telemetry solutions, for example SMS Text or GPRS.

Interfaces:

- · CAN.
- Analog inputs, relay outputs.





North American Distributor

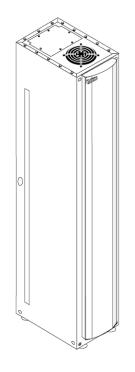
3031 Pleasant View Road, PO Box 620979, Middleton WI 53562 0979 USA • Tel +1 608 831 4116 • Fax +1 608 836 1736 • www.etcarchitectural.com/pharos 4220L1002 Rev. C Printed

Architectural

Copyright © 2004-6 Pharos Architectural Controls Limited. All rights reserved. Specifications subject to change without notice (15-08-2006).

Sensor+ Standard Series





GENERAL INFORMATION

Sensor+ dimming systems provide high density, professional features and exceptional reliability for lighting applications that require the best the entertainment industry can offer.

APPLICATIONS	Professional and educational theatre
	Production studios
	Concert and performance halls
	Themed retail and dining
	Multi-use Convention Centers
	Houses of Worship
FEATURES	High dimmer density
	Up to two 2.4kW dimmers per module
	6, 12, 24, and 48 module racks available
	Rugged industrial construction
	Installation flexibility
	Adaptable modular design
	100,000A Short Circuit Current Rating (SCCR)
	Advanced configuration editing built into rack
	Stores up to 128 Presets in memory
	Direct Ethernet control signal input
	Two DMX512 inputs
	Standard system and rack monitoring with diagnostic reporting
	Supports ETC Dimmer Doubling™
	All racks UL and cUL LISTED
ACCESSORIES	SmartLink Button Stations
	Dimmer Doubler
	Sound Suppression Hood
	Floor pedestal for 24-module rack
	Document holder

ORDERING INFORMATION

Installation Racks

Model#	Description
SR6+	Sensor+ 6 Module Rack
SR12+	Sensor+ 12 Module Rack
SR24+	Sensor+ 24 Module Rack
SR48+	Sensor+ 48 Module Rack
SR6+1P	Sensor+ 6 Module Single Phase Rack
SR12+1P	Sensor+ 12 Module Single Phase Rack
SR24+1P	Sensor+ 24 Module Single Phase Rack

Rack Options*

Model#	Description	
AT12	Amp-Trap [®] fuse option for 12-module rack	
AT24	Amp-Trap fuse option for 24-module rack	
AT48	Amp-Trap fuse option for 48-module rack	
BK12	Bussing kit for 2 — 12-module racks	
BK24	Bussing kit for 2 – 24-module racks	
BK48	Bussing kit for 2 — 48-module racks	
AUX19-12	19" Auxiliary Rack(s) for 12-module rack	
AUX19-24	19" Auxiliary Rack(s) for 24-module rack	
AUX12-48	12" Auxiliary Rack(s) for 48-module rack	
AUX19-48	19" Auxiliary Rack(s) for 48-module rack	
AUX30-48	30" Auxiliary Rack(s) for 48-module rack	
*Vibration Reduction mounts available for all Sensor+ rack.		

Contact ETC for details

Rack Accessories

Model#	Description
SSSh 6-12	Sensor+ Sound Suppression Hood — small
SSSh 24-48	Sensor+ Sound Suppression Hood — large
Pedestal	Floor pedestal for 24-module rack
DH	Document holder

SmartLink Accessories 🖅

Model#	Description	
S-LPB	SmartLink Power Board for Sensor+ Racks*	
S-10005	SmartLink 5-button Station*	
S-10010	SmartLink 10-button Station	
*One SmartLink Power Roard required for station support. S-LPR supports up to		

*One SmartLink Power Board required for station support. S-LPB supports up to four stations. Only one S-LPB or S-LPS may be enabled in a system.



SPECIFICATIONS

GENERAL	Racks available in four sizes SR6+ 6 modules, 12 dimmers maximum SR12+ 12 modules, 24 dimmers maximum SR24+ 24 modules, 48 dimmers maximum SR48+ 48 modules, 96 dimmers maximum
	Dual density (two dimmers per module), single density and half density dimmer modules available
	Operating temperature: 0-40°C / 32-104°F Dimmer room HVAC systems must at all times maintain the specified ambient temperature at the dimmer rack. Dimming systems operating within 10 degrees F of the upper or lower temperature limits must strictly follow installation and operation guidelines to operate reliably.
	Relative humidity: 30-90% non-condensing
	All racks UL and cUL LISTED
	UL924 LISTED for Bypass operation
MECHANICAL	Rugged 16-gauge steel construction
	Fine-textured, scratch-resistant, epoxy paint
	SR6+ and SR12+ uses wall mount installation
	SR24+ can be wall or pedestal mounted
	SR48+ is floor mounted
	Top and bottom conduit access through removable panels (SR48+) or knockouts (SR6+, SR12+, and SR24+)
	No tools required for module removal or installation
	Keyed module slots prevent insertion of inappropriate module types
	Front access to all wiring and terminations
	Full height locking door
	Electrostatic air filter easily removed from door for periodic cleaning
	High efficiency cooling system with airflow sensor
	High visibility LED status beacon
ELECTRICAL	SR6+, SR12+ and SR24+ accept: Three phase 120/208 VAC Single phase 120/240 VAC
	SR48+ accepts
	Three phase 120/208 VAC
	Line feed frequencies from 47-63Hz
	Line feed voltage range is 90-140 VAC Load terminals accept up to #4 AWG (16mm²)
	wire (see chart)
	Short Circuit Current Rating: 100,000A RMS symmetrical @240VAC
	Auxiliary Equipment Racks and custom switchgear/distribution available (Call ETC for details)
CONTROL	Sensor+ Control Electronics Module (CEM+)
ELECTRONICS	Single Ethernet control signal input Two DMX512 inputs
	Standard diagnostic reporting via browser-based interface
	Supports Dimmer Doubling™
	Supports SmartLink control of presets
OPTIONS	Advanced Features [™] dimmer-specific load and diagnostic reporting
	Amp-Trap® fuses to allow feeding individual racks from oversize mains
	All-copper bus kits available
	Vibration reduction kits available for all racks SmartLink Power Board

ORDERING INFORMATION

Dimmer Modules

Standard Sensor Modules		
Model#	Description	
D15	Dual 15A Dimmer Module – 350µS	
D20	Dual 20A Dimmer Module – 350µS	
D15E	Dual 15A Dimmer Module – 500µS	
D20E	Dual 20A Dimmer Module – 500µS	
D50AF	Single 50A Dimmer Module – 500µS	
	– Advanced Features	
D100AF*	Half 100A Dimmer Module – 500µS	
	– Advanced Features	
Special Purpose Sensor	Modules	
Model#	Description	
L10	Dual 10A Low Wattage Dimmer Module	
L10F	Single 10A Low Wattage Fluorescent	
	Dimmer Module	
D15F	Single 15A Fluorescent Dimmer Module	
D20F	Single 20A Fluorescent Dimmer Module	
R15AF	Dual 15A Relay Module – Advanced Features	
R20AF	Dual 20A Relay Module – Advanced Features	
CC15	Dual 15A Constant Circuit Breaker Module	
CC20	Dual 20A Constant Circuit Breaker Module	
AFM	Air Flow Module	

*Half-density modules use two module slots

Control Modules

Model#	Description
CEM+	Control Electronics Module +

WIRING CHARTS

Load Wiring Lug Capacity

Connection	Wire Size
10A, 15A, 20A, and 50A lugs	4 AWG Max. (16mm ²)
100A lugs	2/0 Max.

Primary Feed Lug Capacity

Connection	Wire Size
SR6+	Single 2/0 – 14 AWG
SR12+	Dual 250 kcmil – 6 AWG
SR24+	Dual 350 kcmil – 4 AWG
SR48+	Dual 600 kcmil – 2 AWG

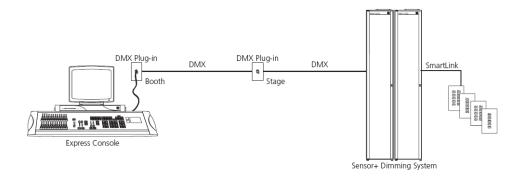
RACK DIMENSIONS

Installation Rack dimensions

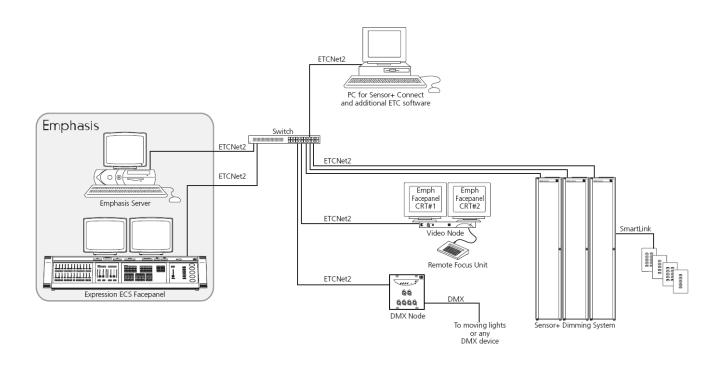
Model	Height		Width		Depth	
	inches	mm	inches	mm	inches	mm
SR6+	16.4	420	14.6	370	13.3	340
SR12+	25.8	660	14.6	370	13.3	340
SR24+	45.8	1160	14.6	370	16.8	430
SR48+	83.1	2110	14.6	370	22.8	580

Sensor+ Standard Series

TYPICAL DMX SYSTEM RISER DIAGRAM

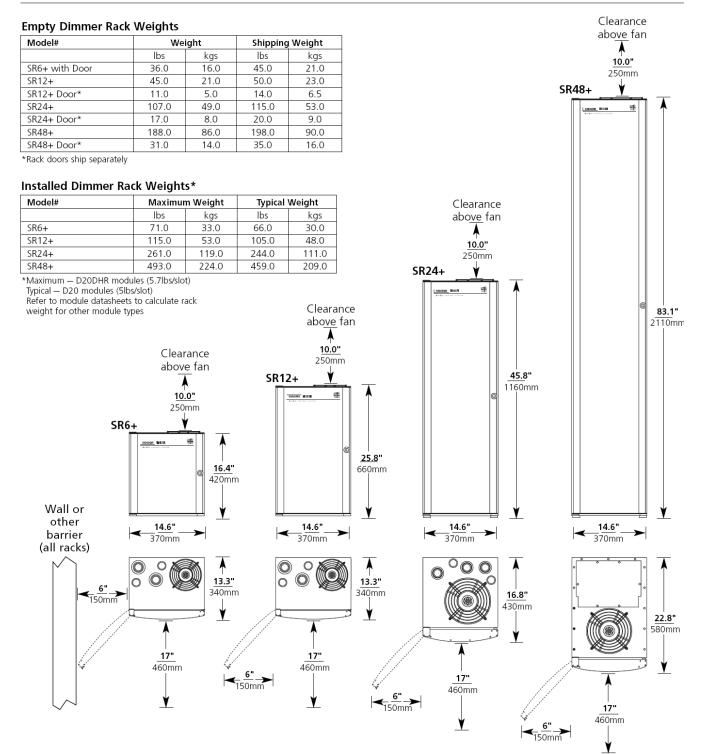


TYPICAL NETWORK SYSTEM RISER DIAGRAM



Sensor+ Standard Series

PHYSICAL





Corporate Headquarters = 3031 Pleasant View Rd, PO Box 620979, Middleton WI 53562 0979 USA = Tel +1 608 831 4116 = Fax +1 608 836 1736 London, UK = Unit 26-28, Victoria Industrial Estate, Victoria Road, London W3 6UU, UK = Tel +44 (0)20 8896 1000 = Fax +44 (0)20 8896 2000 Rome, IT = Via Ennio Quirino Visconti, 11, 00193 Rome, Italy = Tel +39 (06) 32 111 683 = Fax +39 (06) 32 656 990 Holzkirchen, DE = Ohmstrasse 3, 83607 Holzkirchen, Germany = Tel +49 (80 24) 47 00-0 = Fax +49 (80 24) 47 00-3 00 Hong Kong = Room 605-606, Tower III Enterprise Square, 9 Sheung Yue Road, Kowloon Bay, Kowloon, Hong Kong = Tel +852 2799 1220 = Fax +852 2799 9325 Web = www.etcconnect.com = Copyright © 2006 ETC. All Rights Reserved. All product information and specifications subject to change. 7151L1001 Rev. C Printed in USA 01/06

Sensor® products protected by U.S. Patent Numbers 5,323,088, 5,352,958 and 6,002,563; European Number 060333372; German Number 69203609; US and International Patents Pending.

1.02 DIMMER RACK

- A. General
 - 1. The installation rack shall be the Sensor+ as manufactured by Electronic Theatre Controls, Inc., or equal. The fully digital dimmer rack shall consist of up to 48 dimmer module spaces. Sensor rack systems shall be UL Listed and CSA Approved, and shall be so labeled when delivered to job site.
- B. Electrical
 - 1. Sensor racks shall operate at up to 120/208V, three phase, four wire + ground, 47 to 63 Hz at 800 amps max. Provisions shall be made for optional amp trap devices for fault current protection. Standard AIC fault current protection shall be 100,000.
 - 2. All load and neutral terminals shall accept up to a #2 AWG wire.
- C. Electronics
 - 1. Dimmer control electronics shall be contained in one plug-in Control Electronics Module (CEM+). Each CEM+ shall contain no discrete wire connections, and be housed in a formed steel body with an injection-molded face panel.
- D. Physical
 - 1. The Sensor dimmer rack shall be a freestanding, deadfront switchboard, substantially framed and enclosed with 16-gauge, formed steel panels. All rack components shall be properly treated, primed and finished. Exterior surfaces shall be finished in fine texture, scratch resistant, gray epoxy paint. Removable top and bottom panels shall facilitate conduit termination on the 48-module rack. Knockouts shall serve the same purpose on 12 and 24 module racks.
 - 2. Sensor racks shall be available in four sizes, with the following dimensions.

a.	SR6+ (6 module)	16.6" H x 14.8" W x 13.3" D
b.	SR12+ (12 module)	25.8" H x 14.8" W x 13.3" D
c.	SR24+ (24 module)	45.8" H x 14.8" W x 16.8" D
d.	SR48+ (48 module)	83.1" H x 14.8" W x 22.8" D

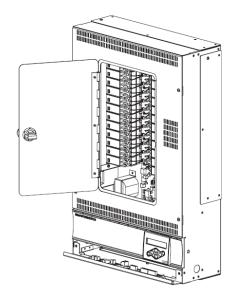
- 3. Racks shall be designed for front access to allow back-to-back or side-by-side installation.
- 4. Racks shall be designed to allow easy insertion and removal of all modules without the use of tools. Supports shall be provided for precise alignment of dimmer modules into power and signal connector blocks. With modules removed, racks shall provide clear front access to all load, neutral and control terminations. Racks that require removable panels to access load, neutral or control terminations shall not be acceptable.
- 5. An optional bus bar kit shall be available from the factory to allow adjacent racks to be powered by a single line feed. No hard, rack-to-rack wiring shall be required. Racks that require discrete cabling to connect adjacent racks shall not be acceptable.
- 6. Module spaces shall be mechanically keyed to accept only the module type (20A, 50A or 100A) specified for that space. Racks that allow modules of varying wattages to plug into the same space shall not be acceptable. The rack shall be configurable to accept mixed dimmer types and sizes throughout the rack.
- 7. Each rack shall provide a lockable full-height door containing an integral electrostatic air filter that shall be removable for easy cleaning. A single low-noise fan shall be located at

the top of each rack. The fan shall draw all intake air through the integral electrostatic air filter, over the surfaces of the module housing and out the top of the rack. The fan shall maintain the temperature of all components at proper operating levels with dimmers under full load, provided the ambient temperature of the dimmer room does not exceed 40°C/104°F. Dimmer racks that do not employ both locking doors and electrostatic air filters shall not be acceptable. The fan shall turn on whenever any dimmer in the system is activated. In the event of an over-temperature condition, only the affected dimmer module(s) shall shut down and a message shall appear on the control module LCD. The fan shall remain on during thermal shutdown of individual dimmer modules.

- 8. An airflow sensor shall be provided. In the event of inadequate airflow, the affected rack shall shut down until the error is corrected.
- If the ambient room temperature drops below 0°C/32°F or rises above 40°C/104°F, a warning shall appear on the dimmer rack LCD. If the temperature rises above 46°C/115° F, the rack shall shut down until the condition is corrected.
- 10. A 3 x .5-inch LED status indicator (beacon) shall be mounted in the rack door. The beacon shall be visible throughout a wide viewing angle. In normal operation conditions, this LED is illuminated. If the rack's control module senses an error condition, the beacon shall flash until the error is corrected. An optional indicator shall be available for remote locations.

Smart Solutions Series

Smartink E



GENERAL INFORMATION

Controlling switched circuits is as simple as SmartSwitch, ETC's relay panel. SmartSwitch can be operated stand alone, with SmartLink, or DMX-controlled from another source. Designed to combine with matching SmartPack Wallmount dimming, SmartSwitch completes a budgetoriented control system.

SmartSwitch comes standard with SmartLink control. When used with the optional LinkPower Supply, the system allows up to four SmartLink Stations to be connected for remote operation of presets and sequences.

APPLICATIONS	Ballrooms
	Restaurants
	Churches
	Small performance spaces
	Multi-purpose rooms
	Entertainment facilities with DMX control
PERFORMANCE	Safe and reliable operation
	Switches relays all at once or variable delay
	SmartLink, DMX-512 or Stand-Alone Control
	Built-in presets and sequencer
FEATURES	Up to 24 Aromat relays per panel
	Mechanically latching relays
	Single-space, single or double pole relays
	120v to 277v switching and control input
	20-amp rated contacts switch with no derating
	Manual ON/OFF lever with indicator on relay
	Relays can be added in the field
	Voltage barrier for discrete relay power feeds
	Optional LinkPower Supply for stations
	UL-924 listed emergency contact input
	Matches SmartPack Wallmount dimming
	Common programming with SmartPack
	Full compliance with UL, cUL, and FCC regulations

ORDERING INFORMATION

Standard SmartSwitch Relay Units

Model#	Description
SS-121P-LPS	SmartSwitch 12 - 20A Single Pole Relays with
	LinkPower Supply
SS-121P	12 - 20A Single Pole Relays
SS-241P-LPS	24 - 20A Single Pole Relays with
	LinkPower Supply
SS-241P	24 - 20A Single Pole Relays

No-Standard Model Numbering

	Qty	Single Pole	/	Qty	Double Pole	LinkPower	
SS-	#	1P	/	#	2P	LPS	

SmartSwitch (SS) – followed by the number of 1P relays, a forward slash, and then the number of 2P relays. Examples:

SS-61P/62P – Six 20A Single Pole relays and six 20A Double Pole relays

SS-21P/102P – Two 20A Single Pole relays and ten 20A Double Pole relays

SS-121P/122P-LPS – Twelve 20A Single Pole Relays, Twelve 20A

Double Pole Relays, and internal LinkPower Supply

SmartSwitch Accessories

SS-1PRK	Single Pole Relay Kit
SS-2PRK	Double Pole Relay Kit
SS-RMK	19" Rack Mount Kit for SmartSwitch
SS-VB	SmartSwitch Voltage Barrier Kit

SmartLink Accessories

S-10005	SmartLink 5-Button Station*	
S-10010	SmartLink 10-Button Station*	
S-LPS	LinkPower Supply Kit	
*Stations require one LinkPower Supply per system		

Only one LinkPower Supply allowed per system Four stations supported



Smart Solutions Series

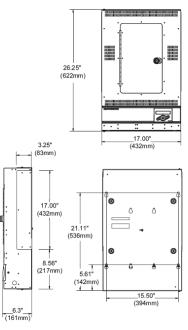
SPECIFICA	ATION S
GENERAL	Approvals and Certifications:
	Underwriters Laboratories tested and listed to the following standards:
	UL508 (File: E92154)
	Complies with ESTA DMX512-A Standard
FEATURES	SmartLink control for presets, and Sequence
	Optional LinkPower Supply powers four stations
	Advanced DMX control of relays:
	Selectable threshold level for on/off
	DMX addressing via keypad
	Soft patch any relay to any DMX channel
	Internal DMX termination switch
	DMX loss and power-up behavior
	32 programmable presets
	Sequencer with programmable times
	Switch all relays at once or select 0.5 to 60 second delay between relays (0.1s steps)
	UL924-listed contact input instantly switches selected relays on, while switching others off
	Multi-lingual interface – English, French, German and Spanish
USER	High-contrast 20-character by 2-line backlit LCD
INTERFACE	6-button menu-navigation keypad
	Power status indicator LED (blue)
	DMX status indicator LED (green)
	On/off status indicator for each relay
MECHANICAL	Panel consists of enclosure, cover with locking door, and internal sub-panel
	ENCLOSURE:16-gauge steel construction
	Black, fine-textured, scratch-resistant paint
	Removable conduit panels on top, bottom and sides
	Full front access (side clearance not required)
	Optional 19" rack mount kit (requires 15u spacing)
	COVER & DOOR: Removable cover allows access to all AC and Class 2 wiring
	Locking door allows controlled access to manual switch of each relay and Class 2 wiring only
	SUB-PANEL: Removable sub-panel containing the electronics and relays can ship separately – contact ETC
	All low-voltage wiring is physically separated from AC by a mechanical barrier
ELECTRICAL	Single panel for up to 24 relays, populated in any combination of single-space, single or double pole
	Separate chambers for Class 1 and Class 2 wiring
	Optional Voltage Barriers install without tools between any relay for partioning between multiple voltages and/or Emergency circuits

CONTROL	Input: 120	√ or 277V (+/- 15%), 60Hz, >8 amps				
ELECTRONICS	Dual-tap transformer primary screw terminals accept up to 12AWG wire					
CONTROL	Easy-access	s flip-down door for all control wiring				
WIRING		e terminals for DMX512, SmartLink and ed Emergency Contact Input				
	Control ter	minals accept maximum of 12AWG wire				
		wiring exiting the enclosure is mited energy				
RELAYS	20A 300V	General Purpose				
RATINGS	20A 300V Ballast (HID)					
	2400W Tungsten @120V					
	0.5 HP @ 120V Motor Load					
	1.5 HP @ 240/277 Motor Load					
	SSCR:	5,000A@ 120V and 277V				
	Inrush:	2000A				
	Isolation:	2,500V RMS				
	State:	Latching				
	Life:	60,000 cycles at full load				
	Terminal:	Accepts 12-14AWG copper wire				
THERMAL		peration temperature between and 45°C (104°F)				
	Humidity k	between 10-90% (non-condensing)				
	Convectior	n cooled				

PHYSICAL

SmartSwitch Dimensions

Model	Height		Height Width		Depth		Weight	
	inches	mm	inches	mm	inches	mm	lbs	kg
SS-121P	26.25	622	17.00	432	6.3	161	29.80	13.51
SS-241P	26.25	622	17.00	432	6.3	161	44.75	20.29





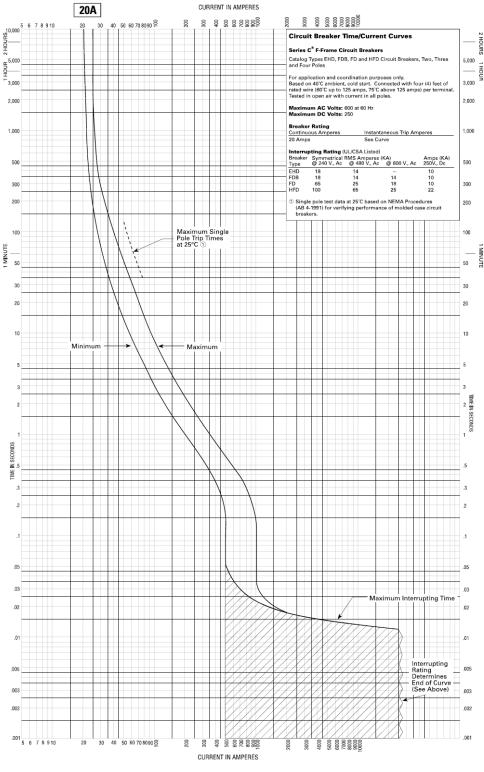
Corporate Headquarters = 3031 Pleasant View Rd, PO Box 620979, Middleton WI 53562 0979 USA = Tel +1 608 831 4116 = Fax +1 608 836 1736 London, UK = Unit 26-28, Victoria Industrial Estate, Victoria Road, London W3 6UU, UK = Tel +44 (0)20 8896 1000 = Fax +44 (0)20 8896 2000 Rome, IT = Via Ennio Quirino Visconti, 11, 00193 Rome, Italy = Tel +39 (06) 32 1116 83 = Fax +39 (06) 32 656 990 Holzkirchen, DE = Ohmstrasse 3, 83607 Holzkirchen, Germany = Tel +49 (80 24) 47 00-0 = Fax +49 (80 24) 47 00-3 00 Hong Kong = Room 605-606, Tower III Enterprise Square, 9 Sheung Yuet Road, Kowloon Bay, Kowloon, Hong Kong = Tel +852 2799 1220 = Fax +852 2799 9325 Web = www.etcconnect.com = Copyright © 2005 ETC. All Rights Reserved. All product information and specifications subject to change. 7023L1001 Rev. A Printed in USA 08/05

Device Coordination Study

AB DE-ION Circuit Breakers

2 HOURS

1 HOUR

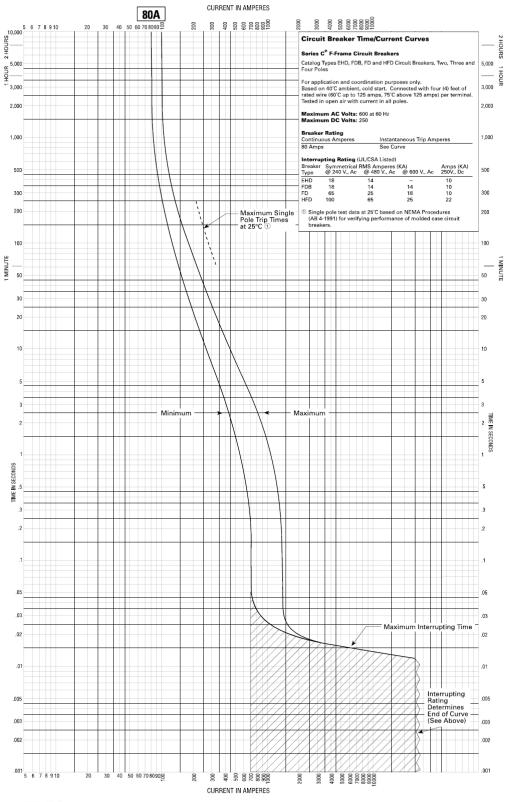


Types EHD, FDB, FD and HFD 20 Amperes

Curve No. SC-4135-87B F-T-N

AB DE-ION Circuit Breakers

Types EHD, FDB, FD and HFD 80 Amperes



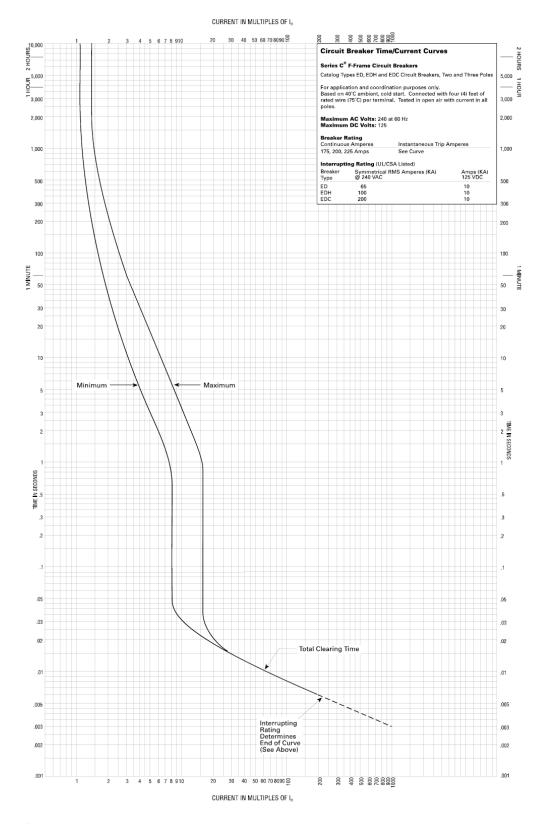
Curve No. SC-4144-87B



October 1997

AB DE-ION Circuit Breakers

Types ED, EDH and EDC 225 Amperes



Curve No. SC-5805-94A **FAT+N**

October 1997

Appendix B-2

Screw In Compact Fluorescent



Product Number: 29288

Order Abbreviation: CF23EL/TWIST

General Description: $\mathsf{D}\mathsf{U}\mathsf{L}\mathsf{U}\mathsf{X}$ 23W TWIST compact fluorescent lamp with integral 120V ballast, mediur CRI, packaged 6/carton.

Product Information						
Abbrev. With Packaging Info.	CF23ELTWIST 120V 6/CS 1/SKU					
Average Rated Life (hr)	10000					
Base	Medium					
Bulb	TWIST					
Color Rendering Index (CRI)	82					
Color Temperature/CCT (K)	3000					
Diameter (in)	2.28					
Diameter (mm)	58					
Family Brand Name	Dulux® EL					
Industry Standards	CSA, FCC 47CFR PART 18 CONSUMER, UL					
Initial Lumens at 25C	1450					
Mean Lumens at 25C	1160					
Maximum Overall Length - MOL (in)	5.875					
Maximum Overall Length - MOL (mm)	149					
Nominal Voltage (V)	120.00					
Nominal Wattage (W)	23.00					

Product Information Bulletin SYLVANIA SOFT WHITE DULUX® EL TWIST

Electronic Compact Fluorescent Lamps



SYLVANIA DULUX EL compact fluorescent lamps are long life, energy efficient alternatives for incandescent lamps in many applications. The general purpose TWIST lamps can be used to replace standard A-shape lamps. The compact heights of the TWIST lamps allow them to fit in many applications. The twist bulb configuration provides for symmetrical Saves up to 75% in energy compared to similar lumen output incandescent lamps

- 10,000 hour average rated lamp life
- Flicker-free starting
- 3000K white light, similar to halogen lamps
- 82 CRI
- Medium base and compact height for easy replacement of ordinary incandescent lamps

Product Availability

Lamp Type General Purpose Twist Wattage 15W, 20W, 23W

illumination similar to that of the A-shape incandescent lamps. Their excellent color rendition and color temperature choices make them natural replacements for incandescent and halogen sources.

Lamp Comparison

Soft White DULUX EL	Life	Lumens	Closest Equivalent Incandescant	Life	Lumens	Watts Saved	Energy* Savings
CF15EL/TWIST	10,000	850	60A/RP	1000	890	45	\$45
CF20EL/TWIST	10,000	1200	75A/RP	750	1210	55	\$55
CF23EL/TWIST	10,000	1450	100A/90/SS	750	1550	67	\$67

* Energy savings over if a of EL lamp at \$0.10/kWh

Application Information

Applications Sconces Table lamps Ceiling fixtures Security lighting Difficult to service areas

Application Notes

- 1. Cannot be installed on dimming circuits.
- 2. Not for use in enclosed indoor fixtures.
- Outdoor application, use only in enclosed fixtures, to avoid exposure to weather.
- 4. Do not use in emergency exit or light fixtures .
- 5. Do not use on electronic timers or photocells.
- 6. Meets CSA, FCC and UL requirements.
- 7. Install and remove lamp from fixture grasping plastic base.
- 8. Never disassemble or modify lamp.
- 9. Use only 120V AC, 60Hz circuit.
- 10. Best performance achieved when operated at 77°F/25°C.

Sample Specification Lamp shall be a SOFT WHITE DULUX EL (15, 20 or 23 Watt) Twist electronic, compact fluorescent lamp. Lamp shall have a 58mm base diameter. Lamp shall have a correlated color temperature of 3000K and a CRI of 82. Average rated lamp life shall be 10,000 hours.

Ordering and Specification Information

	tiern Number	Ordering Abbreviation	Pkg.	Bulb Type	Nominal Wattage	initiai Lumens	Color Temp.	CRI	Average Rated Life (hrs.)	Operating Temp. Range		
General Purpose Twist												
	29296	CF15EL/TWIST	1/box, 6/pkg.	Twist	15	850	3000K	82	10,000	0°F100°F		
	29299	CF15EL/TWIST/1/BL	1/blister, 6/pkg.	Twist	15	850	3000K	82	10,000	0°F100°F		
	29292	CF15EL/TWIST/2/BLC	2/bilster, 12/pkg.	Twist	15	850	3000K	82	10,000	0°F100°F		
	29297	CF20EL/TWIST	1/box, 6/pkg.	Twist	20	1200	3000K	82	10,000	0°F100°F		
	29290	CF20EL/TWIST/1/BL	1/bilster, 6/pkg.	Twist	20	1200	3000K	82	10,000	0°F100°F		
	29298	CF23EL/TWIST	1/box, 6/pkg.	Twist	23	1450	3000K	82	10,000	0°F100°F		
	29291	CF23EL/TWIST/1/BL	1/blister, 6/pkg.	Twist	23	1450	3000K	82	10,000	0°F100°F		

"Average rated life based on an operating cycle of 3 hours on per start with 20 minutes off between starts per industry standards for fluorescent lamp life testing

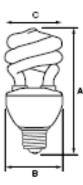
Nominal Lamp Voltage: 120 volts Base: Medium

Ordering Guide

CF	15	EL	/	TWIST	
Compact	Wattage:	Electronic		TWIST	
Fluorescent	15 watts	Ballast		(buib shape)	

Dimensions

	(A) MÖL (in.)	(B) Base Diameter (in.)	(C) Bulb Width (in.)
CF15EL Twist	5.125	2.28	2.17
CF20EL Twist	5.5	2.28	2.17
CF23EL Twist	5.875	2.28	2.17



OCCUPATION OF A DESCRIPTION

Pin Based Compact Fluorescent



Product Number: 20722

Order Abbreviation: CF26DD/E/830/ECO

General Description: DULUX 26W double compact fluorescent lamp with 4-pin base, integral EOL, electronic and dimming ballasts, ECOLOGIC

Product Information								
Abbrev. With Packaging Info.	CF26DDE830ECO 105V 50/CS 1/SKU							
Average Rated Life (hr)	12000							
Base	G24Q-3							
Bulb	D (T4)							
Color Rendering Index (CRI)	82							
Color Temperature/CCT (K)	3000							
Family Brand Name	Dulux® D/E							
Industry Standards	IEC 60901- 2526							
Initial Lumens at 25C	1710							
Mean Lumens at 25C	1470							
Maximum Overall Length - MOL (in)	6.5							
Maximum Overall Length - MOL (mm)	166							
NEMA Generic Designation (current)	CFQ26W/G24Q/830							
Nominal Wattage (W)	26.00							

<u>Pin</u>

Product Information Bulletin

DULUX[®] D/E EOL ECOLOGIC[®]

4-Pin Compact Fluorescent Lamps With End-Of-Life Protection



SYLVANIA DULUX D/E EOL ECOLOGIC lamps are longlife, energy-saving alternatives for incandescent lamps. When paired with SYLVANIA linear ECOLOGIC lamps, all the fluorescent lamps in an installation will be TCLP compliant. Each lamp has a built in feature that will safely shut the lamp down at end of lamp life.

NEMA' has expressed concern regarding the end-of-life operation of small diameter (T5 or less), 4-pin, compact fluorescent lamps. When operated on high frequency, electronic ballasts, these lamps may experience an abnormal end-of-life phenomenon – bulb wall cracking near the lamp base and/or overheating in the base area and possibly melting the lamp base and socket. NEMA recommends that high frequency, electronic ballasts have an end-of-life shutdown circuit which will reliably shut down the system in the rare event of abnormal end-of-life.

1. NEMA: National Electrical Manufacturers Association

Application Information

Applications Recessed ceiling fixtures Wall sconces Exit signs

Showcase lighting Task lighting Garden and walkway lighting

Ballast Information

Fixtures

Contact your OSRAM SYLVANIA representative for

Contact your local fixture agent for available fixtures

information about compatible electronic operating systems

- Compact fluorescent lamps for use on dimming and electronic ballasts
- End-of-Life (EOL) shut down protection
- Pass Federal TCLP tests
 - Pair with linear ECOLOGIC lamps for TCLP compliant installations
- Uses about 1/4 the energy of an incandescent lamp with similar lumen output
- · Long 12,000 hour average rated life
 - Typically 12-16 times longer than standard incandescents
 - Reduces relamping requirements and related costs
- Rare earth phosphors 82 CRI
- 2700K, 3000K, 3500K and 4100K color temperatures
- 86% lumen maintenance

ECOLOGIC is a comprehensive program of OSRAM SYLVANIA focused on addressing environmental issues at all stages of lamp life.



The DULUX D/E EOL ECOLOGIC lamps provide protection for existing ballasts with no end-of-life protection. DULUX D/E EOL ECOLOGIC lamps can also be used with ballasts with end-of-life protection to provide additional protection.

Product Availability

Lamp Type	Wattage	Rated Lumens
CF13DD/E/827	13	900
CF13DD/E/830	13	900
CF13DD/E/835	13	900
CF13DD/E/841	13	900
CF18DD/E/827	18	1150
CF18DD/E/830	18	1150
CF18DD/E/835	18	1150
CF18DD/E/841	18	1150
CF26DD/E/827	26	1710
CF26DD/E/830	26	1710
CF26DD/E/835	26	1710
CF26DD/E/841	26	1710

Application Notes

- 1. 4-Pin, lamps designed for dimming and electronic ballast operation.
- 2. Minimum starting temperature depends on ballast.
- Rule of thumb: to estimate the appropriate compact fluorescent lamp wattage, divide the incandescent wattage by 4.
- 4. Lamps manufactured to prevent abnormal end-of-life lamp failures.
- Equipment manufacturers are advised to consult ANSI and IEC standards for the maximum allowable dimensions and temperature to insure compatibility with similar products.

SEE THE WORLD IN A NEW LIGHT





Sample Specification

Lamp(s) shall be (a) DULUX D/E ECOLOGIC (CF13DD/E, CF18DD/E or CF26DD/E) lamps with internal end-of-life shut down feature and pass existing Federal TCLP limits. Lamps shall have an average rated life of 12,000 hours, a correlated color temperature of (2700K, 3000K, 3500K or 4100K), and a CRI of 82. Lamps shall have a (G24q-1, G24q-2, G24q-3) plug-in, 4-pin base and be suitable for use on electronic and dimming ballasts. Lamps shall be operated by QUICKTBONIC® Professional ballasts. Both lamps and ballasts covered by the QUICK 60+^e system warranty.

Ordering and Specification Information

ltem Number	Ordering Abbreviation	NEMA Generic Description	Watts	Base	Initial Lumens	Mean Lumens ¹	Color Temp.	CRI	Avg. Rated Life (hrs.)²	Amps ³	Volts ²
20682	CF13DD/E/827	CFQ13W/G24q/27	13	G24q-1	900	774	2700K	82	12,000	0.165	77
20721	CF13DD/E/830	CFQ13W/G24q/30	13	G24q-1	900	774	3000K	82	12,000	0.165	77
20671	CF13DD/E/835	CFQ13W/G24q/35	13	G24q-1	900	774	3500K	82	12,000	0.165	77
20667	CF13DD/E/841	CFQ13W/G24q/41	13	G24q-1	900	774	4100K	82	12,000	0.165	77
20683	CF18DD/E/827	CFQ18W/G24q/27	18	G24q-2	1150	989	2700K	82	12,000	0.210	80
20724	CF18DD/E/830	CFQ18W/G24q/30	18	G24q-2	1150	989	3000K	82	12,000	0.210	80
20672	CF18DD/E/835	CFQ18W/G24q/35	18	G24q-2	1150	989	3500K	82	12,000	0.210	80
20668	CF18DD/E/841	CFQ18W/G24q/41	18	G24q-2	1150	989	4100K	82	12,000	0.210	80
20684	CF26DD/E/827	CFQ26W/G24q/27	26	G24q-3	1710	1470	2700K	82	12,000	0.300	80
20722	CF26DD/E/830	CFQ26W/G24q/30	26	G24q-3	1710	1470	3000K	82	12,000	0.300	80
20673	CF26DD/E/835	CFQ26W/G24q/35	26	G24q-3	1710	1470	3500K	82	12,000	0.300	80
20669	CF26DD/E/841	CFQ26W/G24q/41	26	G24q-3	1710	1470	4100K	82	12,000	0.300	80

1. Measured at 40% (4,000 hours) of rated life.

2. Based on 3 hours per start. Number of operating hours when half have failed and half are still operating. 3. At 25 KHz

Lamp Comparison Compact Fluorescent vs Incandescent

Lamp Type	Rated Lamp Life	Ballast Factor	System Lumens	System Wattage	System LPW	Energy Savings
2 - 26 Watt DULUX D ECOLOGIC	12,000 hours	1.0	3600	48	51	76%
1 - 200A Watt Incandescent	750 hours	1.0	3800	200	75	-

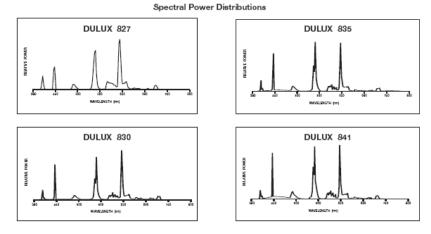
Ordering Guide

CF	26	DD	1	E	1	8	27	
Compact	Wattage:	DULUX		for electronic		8=82 CRI	27=2700K	
Fluorescent	13, 18, or 26	Double		and dimming			30=3000K	
	Watts			ballasts			35=3500K	
							41=4100K	

Dimensions

А	Ordering Abbreviation	(A) Max. Overall Length [in (mm)]	(B) Base Face to Top of Lamp [in (mm)]	(C) Guide Post Length [in (mm)]	(D) Max. Base Width [in (mm)]	
	CF13DD/E CF18DD/E CF26DD/E	5.2 (132) 5.8 (147) 6.6 (168)	4.5 (114) 5.1 (130) 5.9 (150)	0.62 (16) 0.62 (16) 0.62 (16)	1.4 (35) 1.4 (35) 1.4 (35)	
E te		ing = 0.5 inches (12.7 n		0.02 (10)	1.4 (55)	

Technical Information



SYLVANIA, ECOLOGIC and QUICK 60+ are registered trademarks of OSRAM SYLVANIA, Inc. DULUX and QUICKTRONIC are registered trademarks of OSRAM GmbH, Germany, used under license.



Industrial & Commercial Phone: 1-800-255-5042 Fax: 1-800-255-5043

National Accounts

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

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

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

OSRAM SYLVANIA Ballast Division 800 N. Church Street Lake Zurich, IL 60047 Phone: 1-800-654-0089 Fax: 1-847-726-6424

In Canada OSRAM SYLVANIA LTD. Headquarters 2001 Drew Road Mississauga, ON L5S 1S4 Industrial & Commercial

Phone: 1-800-263-2852 Fax: 1-800-667-6772 Special Markets

Phone: 1-800-265-2852 Fax: 1-800-667-6772

Visit our website: www.sylvania.com

Pin Based CFL Ballast



Product Number: 51738

Order QTP 1/2XCF/UNV BM Abbreviation:

General Description:

1/2-lamp universal 120-277V programmed rapid start normal ballast factor electronic ballast in a metal enclosure bottom tion: mount without leads for 26W 4-pin compact fluorescent lamp

	Product Information
Abbrev. With Packaging Info.	QTP12XCFUNVBM
Ballast Factor	1.00
Ballast Height H (in)	1.3500
Ballast Length L (in)	4.9500
Ballast Width W (in)	2.9300
Circuit Type	Series
Family Brand Name	QUICKTRONIC Professional
Input Wattage (W)	32.00
Nominal Voltage (V)	UNIVERSAL 120-277
Number of Lamps	1
Power Factor	>98%
Sound Rating	А
Starting Method	Programmed Rapid Start
Starting Temperature - Fahrenheit	-5
Starting Temperature - Celsius	-20
Total Harmonic Distortion (THD)	<10%
Wiring Method	Plug-in Connectors

<10% THD Electronic T4 Compact Fluorescent Systems **QUICKTRONIC® CF – UNIVERSAL**

Professional Series

Lamp/Ballast Guide

Primary Systems 13W T4 – DULUX D/E, T/E 1-lamp or 2-lamp QTP1/2x13CF/UNV

18W T4 – DULUX D/E, T/E 1-lamp or 2-lamp QTP1/2x18CF/UNV

26W T4 – DULUX D/E, T/E 1-lamp QTP2x26CF/UNV QTP1/2xCF/UNV 2-lamp QTP2x26CF/UNV QTP1/2xCF/UNV

32 or 42W T4 – DULUX T/E 1-lamp QTP2x26CF/UNV QTP1/2xCF/UNV 2-lamp QTP2x26/32/42CF/UNV

57W or 70W T4 – DULUX T/E 1-lamp QTP1x57CF/UNV

For other lamp types, refer to the Performance Guide section on the next page.

Key System Features

- Universal Input Voltage
- PROStart[®] Ballasts
- QUICKSENSE[®] Ballast Technigy.
- High Power Factor
- Low Harmonic Distortion
- Small size and lightweight
- Metal or plastic enclosure
- Four mounting styles
- UL, CSA, FCC
- QUICK 60+ warranty

Application Information

SYLVANIA QUICKTRONIC CF is ideally suited for:

- Recessed Downlights
- Wall Sconces
- Ceiling Fixtures
- Commercial
- Retail, Hospitality, Institutional

SYLVANIA QUICKTRONIC CF

operates DULUX[®] D/E and T/E lamps with full lumen output and optimal system performance.

QUICKTRONIC CF features four mounting styles of low profile, lightweight enclosures to provide simple assembly for any fixture application. Quick Mount, our distinctive snap-and-lock design, speeds assembly by eliminating the use of mounting screws.

Universal Input Voltage (120–277V) and multi-lamp multi-watt capability allow for fewer SKUs to support a wide range of applications.

Setting the standard for quality, QUICKTRONIC CF is also covered by our QUICK 60+[®] warranty, the first and most comprehensive system warranty in the industry.

System Information

PROStart[®] programmed rapid start is the optimum starting method, providing up to 100,000 switching cycles for use on occupancy sensors and building control systems.

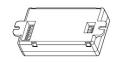
QUICKSENSE® end of lamp life sensing technology helps to protect against overheated bases and sockets, as well as cracking of the glass wall. QUICKSENSE ballast technology uses dynamic end-of-lamp-life sensing to avoid false shutdowns caused by some static sensing methods and will auto-reset when the end-of-life lamps are replaced with new ones.

QUICKTRONIC CF comes with wire-trap connectors for quick and easy installation.

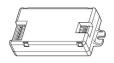
A complete OSRAM SYLVANIA System Performance Guide showing performance characteristics of lamps and ballasts is available upon request.



Plastic Enclosure Styles (S)



BS = Bottom Mount for recessed downlight fixtures



TS = Top Mount for ceiling and wall sconce installation

Metal Enclosure Styles (M)

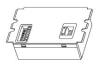
BM = Bottom Mount for recessed

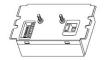
downlight fixtures

PM = Bottom Mount with PEM

studs for recessed

downlight fixtures







TM = Top Mount with PEM studs for ceiling and wall sconce installation

SEE THE WORLD IN A NEW LIGHT

CF UNIVERSAL Normal Ballast Factor

<10% THD Electronic T4 Compact Fluorescent Systems

ltem		Input Voltage	Input Current	Lamp ¹	Rated ² Lumens	No. of	Ballast Factor	System	Input Power	System Efficacy	Performance Guide
Number	Description ³	(VAC)	(AMPS)	Туре	(Im)	Lamps	(BF)	Lumens	(Watts)	(Im/W)	QTP 2x26CF/UNV models
51718 51748	QTP 1/2x13CF/UNV BS QTP 1/2x13CF/UNV TS	1 20-277	0.25/0.11	13W DD/E,T/E 13W DD/E,T/E	900 900	1 2	1.00 1.00	900 1800	16 29	56 62	also operates: 1-lamp CF28/2D, CF38/2D, FPC40/T5, FT40DL
51723 51753	QTP 1/2x18CF/UNV BS QTP 1/2x18CF/UNV TS	120-277	0.32/0.14	18W DD/E,T/E 18W DD/E,T/E	1200 1200	1 2	1.00 1.00	1200 2400	20 38	60 63	1- or 2-lamp
51733 51763	QTP 2x26CF/UNV BS QTP 2x26CF/UNV TS	120-277	0.50/0.22	26W DD/E,T/E 26W DD/E,T/E 32W DT/E 42W DT/E	1800 1800 2400 3200	1 2 1 1	1.00 1.00 0.98 1.00	1800 3600 2350 3200	28 54 35 45	64 67 67 71	FPC22/T5, FT24DL, FT24DF 2-lamp CF13DSE, FT18DL, FT18DF, CF21/2D
51738 51798 51768	QTP 1/2xCF/UNV BM QTP 1/2xCF/UNV PM QTP 1/2xCF/UNV TM	120-277	0.57/0.25	26W DD/E,T/E 26W DD/E,T/E 32W DT/E 42W DT/E	1800 1800 2400 3200	1 2 1 1	1.02 1.02 0.97 1.00	1830 3670 2330 3200	28 57 36 46	65 64 65 70	QTP 2x26/32/42CF/UNV models also operates: 2-lamp FT36DL, FT40DL, FPC40T5
51743 51803 51773	QTP 2x26/32/42CF/UNV BM QTP 2x26/32/42CF/UNV PM QTP 2x26/32/42CF/UNV TM	120-277	0.90/0.40	26W DT/E 32W DT/E 42W DT/E	1800 2400 3200	2 2 2	1.02 0.96 0.95	3670 4600 6080	54 69 94	68 67 65	1+1 FPC22/T5 / FPC40/T5
51740 51800	QTP 1x57CF/UNV BM QTP 1x57CF/UNV PM	120-277	0.53/0.23 0.57/0.25	57W DT/E 70W DT/E	4300 5200	1 1	1.00 0.92	4300 4780	62 71	69 67	

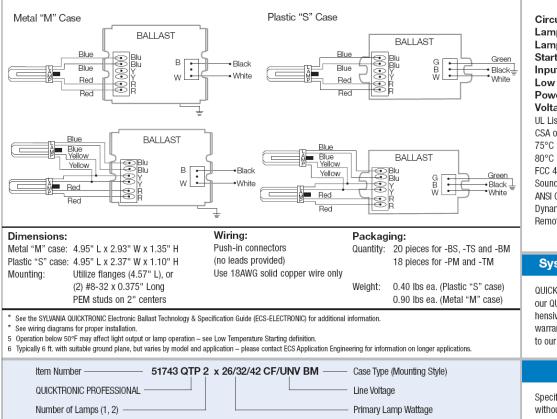
1 Also compatible with other manufacturers' equivalent 4 pin lamp types that meet ANSI standards.

Rated lamp lumens and performance data based on DULUX T/E series 4 pin lamps.

Data is for all three models within the brackets. The maximum input current is shown for maximum input power.
 Discontinued: 51778 QTP 1/2x13CF/UNV QS, 51783 QTP 1/2x18CF/UNV QS, 51793 QTP 2x26CF/UNV QS

COMING ATTRACTIONS: Dual Entry: QTP2x26/32/42CF/UNV DM (51843), QTP2x26/32/42CF/UNV DM PEM (51863) and

QTP2x57/CF/UNV DM (51745) , QTP2x57/CF/UNV DM PEM (51805) available Q1 2006.

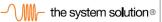


OSRAM SYLVANIA National Customer Service and Sales Center 1-800-LIGHTBULB (1-800-544-4828) www.sylvania.com

Specifications*

Starting Method: Programmed Rapid-Start Circuit Type: Series Lamp Frequency: > 40KHz Lamp CCF: Less than 1.7 Starting Temp: -5°F/-20°C min.5 Input Frequency: 50/60 Hz Low THD: < 10% Power Factor: > 98% Voltage Range: 108-305V UL Listed Class P, Type 1 Outdoor CSA or C/UL Certified 75°C Max Case Temp. (5 yr. warranty) 80°C Max Case Temp. (3 yr. warranty) FCC 47CFR Part 18 Non-Consumer Sound Rated A ANSI C62.41 Cat. A Transient Protection Dynamic End-of-Lamp-Life Sensing Remote Mounting Capability⁶ System Life / Warranty QUICKTRONIC products are covered by our QUICK 60+ warranty, a comprehensive lamp and ballast system warranty. For additional details, refer to our QUICK 60+ warranty bulletin. **Ordering Guide**

Specifications subject to change without notice.



5

Appendix C

Boiler Selection



AAE 3000 Natural Gas c/w CSD-1 Gas train Assembly Flame Safeguard and Full Modulation Gas Valve (Control panel enclosure removed for Display)



- A true Two-Pass Flow Design
- Supply and Return can be
- connected from either side.
 Heat exchanger is supplied fully welded by certified ASME welders
- No field assembly required
- No gaskets or push nipples

DEPENDABLE AND ENERGY EFFICIENT PERFORMANCE

For more than fifty years, Allied Engineering has been an innovator in designing outstanding heating products, providing unparalleled customer service and excellent sales support. "AAE Series" boilers include all of the innovations, efficiencies and technologies developed over these years making it one of the most dependable, energy efficient and long life boilers on the market today. Our engineering and development guidelines for quality, ease of operation, simple installation and low capital cost have been achieved.

UNIQUE "DOUBLE PASS" STEEL FINNED TUBE HEAT EXCHANGER

Using the strength and durability of steel tube our engineers have greatly increased the heat transfer surface by continuously welding a spiral fin to each heat exchanger tube. These finned tubes are then welded to headers to form a top or bottom section. The two sections are welded using a 180° riser to complete the unique double pass heat exchanger design. This sturdy light weight design resists thermal shock and plugging of the heat exchanger due to large waterways provided by the 2" OD ASME (SA178A) boiler tube. In addition, the large waterways result in minimal pressure drop through the boiler and can reduce circulator cost. No other boiler combines these features to its' advantage for strength, rigidity, low cost and environmentally friendly construction.

RAPID RESPONSE TIME

The rapid response time of the AAE Series boilers ensure that all "calls for heat" are met promptly. This is of particular importance when used as a heat source for an indirectly fired water heater or a tankless coil.

EASE OF INSTALLATION/OPERATION

Fully assembled "AAE" boilers have a reputation for being simple to install and even simpler to operate and maintain. While we pride ourselves with this simplicity we also offer as options the very latest in sophisticated control systems and direct digital control terminal contacts. If necessary the boiler can be easily dismantled and reassembled to allow passage through narrow aisles and doorways.

VERSATILE BOILER APPLICATIONS

The Super Hot "AAE Series" with its wide range of sizes (480,000 to 3,000,000 Btu/h) has numerous end uses including High Rises, Apartments, Schools, Snow Melt, Hotels and Motels and many other Industrial and Commercial applications. Combine your Super Hot boiler with our "C Series" external indirect copper coils or "EP Series" stainless steel indirect water heaters for years of fast and efficient service of domestic hot water. Ideally suited and easily connected for modular installations.

CSA TESTED FOR MINIMUM EFFICIENCY OF 80%.

STANDARD EQUIPMENT

- Intermittent Electronic Ignition
- Single Stage Gas Valve
- Two Stage Gas Valve
- Redundant Gas Valve
- Temperature/Pressure Gauge
- On/Off Switch with Indicator Light
 Alarm Feature
- Operating Aquastat
- High Limit
- 30 psi A.S.M.E. Pressure Relief Valve
 Combination Seismic Restraint/Lifting Lugs
- 24 Volt Transformer and Fuse
- Draft Hood
- Control Panel Enclosure
- Propane

OPTIONAL EQUIPMENT

Low Water Cut Off

Flame Supervision

Indoor/Outdoor Control

Full Modulation Gas Valve

Higher Pressure A.S.M.E Relief Valves

High/Low Gas Pressure Switches

Auto/Manual Switch

Flow Switch

STAINLESS STEEL ATMOSPHERIC BURNERS

Our computer designed burners are manufactured of high grade heat resistant stainless steel to ensure years of trouble free service, excellent performance and fuel efficiency. The tubular design has virtually eliminated combustion noise.

QUALITY CONTROL

"AAE Series" boilers are manufactured to the American Society of Mechanical Engineers standards. Designed to A.S.M.E. Section IV with a maximum working pressure of 160 psi (1100 kpa) and a maximum operating temperature of 250°F (120°C). Each heat exchanger is tested to 240 psi to ensure leak proof integrity of every boiler leaving the plant. Allied Engineering has a certificate of authorization for use of the "U" stamp for pressure vessels and the "H" stamp for heating boilers which is continually audited by A.S.M.E. and their authorized inspectors.

TEN YEAR LIMITED WARRANTY PROTECTION

Super Hot "AAE Series" boilers are manufactured under the highest standard of quality control, material and workmanship. Our proven design features a ten year warranty on the heat exchanger and one year on all parts and controls. See printed warranty for details. Installation, operating and maintenance instructions are supplied with every boiler.

AAE 1080 Natural Gas c/w High/Low Fire Two Stage Gas Valve (Control panel enclosure removed for Display).

Burner Drawer Assembly with High Grade Stainless Steel Burners

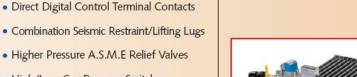
Available in the following codes for controls, safety devices and gas fuel trains.

- ASME CSD-1
- California
- Insurance IRI or FM



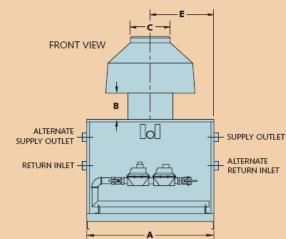


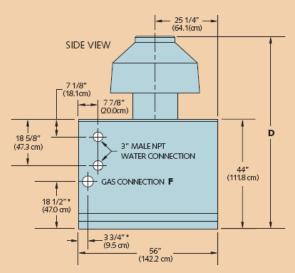






DIMENSIONS AND SPECIFICATIONS



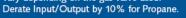


Note: 3" NPT water connections extend 1 1/2" on each side from Boiler Jacket

MODEL	INPUT	OUTPUT	r	D	MA	DI	мв	D	мс	DI	MD	••D	IM E	*GAS CONN F	WA CON		SHIP	
NUMBER	MBH kW	MBH KW	H.P.	in	cm	in	cm	in	cm	in	cm	in	cm	NPT	U.S. GAL.	L	lb	Kg
AAE480 AAE600	480 141 600 176		11.5 14.3		61.0 68.6	10.5 10.5	26.7 26.7	10 10	25.4 25.4	68.9 68.9	175.0 175.0	12.0 13.5	30.5 34.3	1" 1"	5.56 6.75	21.0 25.5	675 725	307 330
AAE720 AAE840	720 211 840 246	576 169	17.2 20.1		76.2 83.8	10.5 10.5	26.7 26.7	12 14	30.5 35.6	71.2 72.9	181.0 185.1	15.0 16.5	38.1 41.9	1" 1"	7.95 9.14	30.1 34.6	790 860	359 391
AAE960 AAE1080	960 281 1080 317	768 225	22.9 25.8	36	91.4 99.0	10.5	26.7 26.7	14 14 16	35.6 40.6	72.9 76.0	185.1 193.0	18.0 19.5	45.7 49.5	1 1/4" 1 1/4"	10.34	39.1 43.6	940 990	427 450
AAE1200	1200 352	960 281	28.7	42	106.7	10.5	26.7	16	40.6	76.0	193.0	21.0	53.3	1 1/4"	12.73	48.2	1050	477
AAE1320 AAE1440	1320 387 1440 422		31.5 34.4		114.3 121.9	10.5 10.5	26.7 26.7	18 18	45.7 45.7	77.3 77.3	196.3 196.3	22.5 24.0	57.2 61.0	1 1/4" 1 1/4"	13.92 15.12		1140 1205	518 548
AAE1560 AAE1680	1560 457 1680 492		37.3 40.1		129.5 137.2	10.5 10.5	26.7 26.7	20	45.7 50.8	77.3 78.7	196.3 199.9	25.5 27.0	64.8 68.6	1 1/4" 1 1/2"	16.31 17.51	61.7 66.3	1270 1350	614
AAE1800 AAE1920	1800 528 1920 563		43.0 45.9		144.8 152.4	10.5 10.5	26.7 26.7	22 22	55.9 55.9	80.7 80.7	205.0 205.0	28.5 30.0	72.4 76.2	1 1/2" 1 1/2"	18.70 19.90	70.8 75.3	1440 1520	655 691
AAE1920 AAE2040	2040 598		45.9 48.7		152.4	10.5	26.7	22	61.0	80.7 82.6	209.8	31.5	76.2 80.0	11/2"	21.09	79.8	1605	730
AAE2160 AAE2280	2160 634 2280 669		51.6 54.5		167.6 175.2	10.5 10.5	26.7 26.7	24 24	61.0 61.0	82.6 82.6	209.8 209.8	33.0 34.5	83.8 87.6	1 1/2" 1 1/2"	22.28 23.48	84.3 88.9	1645 1690	748 768
AAE2400 AAE2495	2400 703 2495 731		57.3 59.6		182.9 190.5	10.5 12.0	26.7 30.5	24 2×18	61.0 2×45.7	82.6 78.8	209.8 200.2	36.0 2x18.25	91.4 2x46.4	1 1/2" 2"	24.67 25.87	93.4 97.9	1770 1850	805 841
AAE2640 AAE2760	2640 774 2760 809	2112 619	63.1 65.9	78	198.1 205.7	12.0	30.5 30.5	2×18	2x45.7 2x45.7	78.8 78.8	200.2	2x19.75 2x20.25	2×50.2	2" 2"	27.06	102.4	1890 1935	859 880
AAE2880 AAE3000	2880 845 3000 880	2304 675	68.8 71.7	84	213.4 221.0	12.0	30.5 30.5	2×18	2x45.7 2x45.7 2x45.7	78.8 78.8	200.2	2x21.00 2x21.75	2×53.3	2" 2"	29.45 30.65	111.5	1975 2020	898 918

** AAE 2495 and larger use two draft hoods. Dimension "E" is

measured from both left and right sides. * Gas Connection "F" shows typical sizes only. Connections may vary depending on the gas valve used.











ALLIED ENGINEERING COMPANY DIVISION OF E-Z-RECT MANUFACTURING LTD.

Manufacturers of Gas and Electric Boilers. Tankless Coils. Electric Boosters 94 Riverside Drive, North Vancouver, B.C. V7H 2M6 • TEL: 604.929.1214 • FAX: 604.929.5184 www.alliedboilers.com

15M 2/04

PRINTED IN CANADA

Pump Selection

Bell & Gossett[®]

System Parameters		
System Flow:	160	U.S. Gallons per Minute (GPM) 🛛 💌
Pump Head:	30	Feet of Water
Pumps in parallel	2 💌	For multiple pumps in parallel, system flow will be split equally.
System Motor Speed		
Motor Speed:	Any RPM / 60 Hz 🛛 💌	
C ESP-Optimized	TM Motor Selection	
Use Non-Overl		
🔘 Select Based o	-	
Minimum HP Req.	None,Let ESP Determine	HP 🔽
System Options Cha	ange Fluid	
Viscosity	31	(SSU)
Specific Gravity	1	
Fluid	water	
Run Selection		
Output Units		
English Units		Select Pumps
O Metric Units		
Pump Series		
Booster Small Circulator 60 In-Line Booster 1" to 1-		
1522 Floor-Mounted Boost		
90 In-Line Close-Coupled		
🔲 1535 Small Close-Couple		
80 In-Line Close Coupled		
80SC In-Line Split Couple		
1510 Base-Mounted End- 1531 Close-Coupled End		
	-Suction, Top-Suction/Top-Disch.	

- □ VSCS Split Case, Double-Suction. Side-Suction/Top-Disch.
 □ VSH Split case, Double-Suction, Side-Suction/Side-Discharge

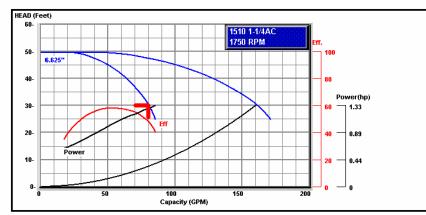
Wastewater Sump, Effluent and Sewage Pumps

Bell & Gossett[®]

					SUMMARY		SUMMARY								
Input Parameters:			: 160.0 gpm		# Pumps: 2		Head: 30 ft	Visc: 31							
PumpSeries	Model	Speed (RPM)	Pump Efficiency	Duty Point	Motor Size	(HP)	Impeller Size (in)	Weight(lbs)							
#1510	1-1/4AC	1750	47.85	1.28	1.5		6.625	160							
1510	1-1/2AC	1750	64.27	0.94	1.5		5.75	170							
1510	2AC	1750	61.19	1	1.5		5.75	180							
1510	2-1/2AB	1750	58.48	1.04	2		5.625	200							
#1510	1-1/2BC	1150	58.15	1.05	1.5		8.5	220							
1510	3AC	1750	42.35	1.45	3		5.875	210							
1510	2BC	1150	64.38	0.95	1.5		8.375	260							
1510	2-1/2BB	1150	60.53	1.01	2		8.25	265							
1510	4AC	1750	30.94	1.99	5		5.875	295							

indicates Single pump operation does not cross system curve. Please consult your local Bell & Gossett representative, or current B&G published technical data, to verify the available maximum working pressure capabilities of the model and size selected.

	DETAIL S	UMMARY	
Pump Series:	1510	Pump Size:	1-1/4AC
Flow Rate: (USGPM)	80	Total Head: (ft.)	30
Pump Speed (RPM)	1750	NPSH req (ft)	7.4
Weight: (lbs)	160	Cost Index:	100
Suction Size: (in)	1.5	Suction Velocity (fps)	12.6
Discharge Size: (in)	1.25	Discharge Velocity: (fps)	17.2
Impeller Diameter: (in)	6.625	Efficiency: (%)	47.85
Max Impeller Dia (in)	7.		
Max Flow (USGPM)	86	Duty Flow/Max Flow (%)	0.94
Flow @ BEP (USGPM)	53	Min. Rec. Flow: (USGPM)	10
Motor Power, HP:	1.5	Frame Size:	145T
Pump Power (BHP)	1.28		
Max Power (BHP)	1.33	Aprox Wt (lbs)	

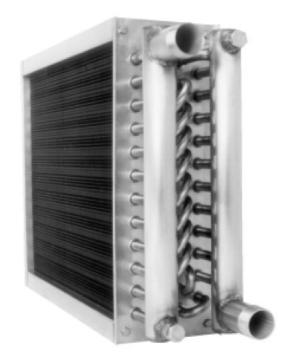


Coil Selection

LUVATA



Fluid Coil Installation Operation and Maintenance

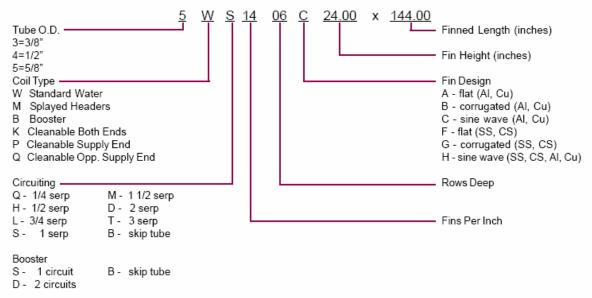


LUVATA GRENADA LLC

PO Box 1457 / 1000 Heatcraft Drive, Grenada, MS 38902-1457 Tel: 800-225-4328 / 662-229-4000 Fax: 662-229-4212 Email: coils@luvata.com Web Site: www.luvata.com/heatcraft Guidelines for the installation, operation and maintenance of Heatcraft cooling and heating coils have been provided to help insure the proper performance of the coils and their longevity. These are general guidelines that may have to be tailored to meet the specific requirements of any one job. As always, the installation and maintenance of any coil should be performed by a qualified party or individual. Protective equipment such as safety glasses, steel toe boots and gloves are recommended during the installation and routine maintenance of the coil.

Receiving Instructions

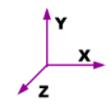
- 1. All Heatcraft coils are factory tested, inspected and carefully packaged.
- Damage to the coils can occur after they have left the factory. Therefore, the coils should be inspected for shipping damage upon receipt. The freight bill should also be checked against items received for complete delivery.
- Damaged and/or missing items should be noted on the carrier's freight bill and signed by the driver.
- 4. For additional assistance, contact your local Heatcraft coil representative.



Nomenclature

Mounting

×	Horizontal Air Flow Horizontal Tubes	Level with the y-axis and x-axis.
	Vertical Air Flow ² Horizontal Tubes	Level with the z-axis and x-axis.
×	Horizontal Air Flow Vertical Tubes	Level with the y-axis and x-axis.

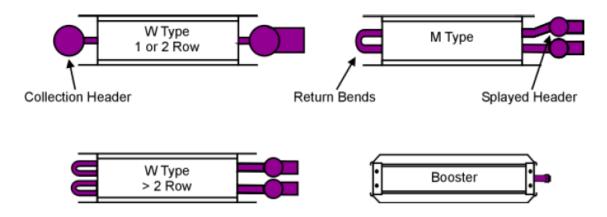


- 1. All Heatcraft water and glycol coils are designed to be fully drainable when properly mounted.
- 2. Vertical air-flow is not recommended for dehumidifying coils.

Coil Types

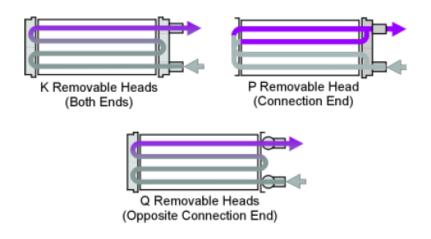
Standard Fluid Coils

Heatcraft fluid coils are specifically designed for your particular application. Flexibility is built into our manufacturing processes, offering variations in fin type, fin density, circuitry arrangement, coil casing and materials of construction. Standard fluid type "W" coils utilize a collection header for one and two row applications and return bends for applications that require three or more rows. Type "M" coils are used for one and two row applications that require same end connections. For type "M" coils the supply and return headers are offset or "splayed." This orientation allows for the supply and return headers to be placed side by side. Booster coils, type "B," are also available for one and two row applications.



Cleanable Fluid Coils

We offer cleanable fluid coils for applications where mechanical cleaning of the internal surface of the tubes are required. Our cleanable coils utilize a box-style head in lieu of cylindrical headers. The head contains baffles for circuiting and is removable for easy access to coil tubes. Type "P" coils are cleanable from the supply end of the coil. Type "Q" coils are cleanable from the end opposite the supply. Type "K" coils are cleanable from both ends of the coil.





FLUID COIL SPECIFICATION

1.0 CERTIFICATION

Acceptable coils are to have ARI Standard 410 certification and bear the ARI symbol. Coils exceeding the scope of the manufacturer's certification and/or the range of ARI's standard rating conditions will be considered provided the manufacturer is a current member of the ARI Air-Cooling and Air-Heating Coils certification program and the coils have been rated in accordance to ARI Standard 410. Manufacturer must be ISO 9002 certified.

1.1 FLUID COIL DESIGN PRESSURES AND TEMPERATURES

Coils shall be designed to withstand 250 psi maximum operating pressures and a maximum fluid temperature of 300°F for standard duty copper tube coils. Optional high pressure construction will include cupronickel tubes and headers to increase maximum operating pressure to 350 psi and maximum operating temperature to 450°F. For cleanable coils with removable heads, coils shall be designed to withstand 100 psi maximum operating pressures and a maximum fluid temperature of 150°F. Higher limits are available, depending on coil construction and/or materials used.

1.2 FACTORY TESTING REQUIREMENTS

Coils shall be submerged in water and tested with a minimum of 315 psi air pressure for standard copper tube coils and 125 psi for cleanable coils with removable heads. A 500 psig hydrostatic and shock test is required for high pressure cupronickel construction. Coils must display a tag with the inspector's identification as proof of testing.

1.3 FINS

Coils shall be of plate fin type construction providing uniform support for all coil tubes. Stainless steel fins shall be constructed of 304 & 316 stainless. Carbon steel fins shall be constructed of ASTM A109-83. Coils are to be manufactured with die-formed aluminum, copper, stainless steel or carbon steel fins with self-spacing collars which completely cover the entire tube surface. The fin thickness shall be 0.0075 +/- 5% unless otherwise specified. Manufacturer must be capable of providing self-spacing die-formed fins 4 through 14 fins/inch with a tolerance of +/- 4%.

1.4 TUBING

Tubing and return bends shall be constructed from UNS 12200 seamless copper conforming to ASTM B75 and ASTM B251 for standard pressure applications. High pressure construction shall use seamless 90/10 Cupronickel alloy C70600 per ASTM B111. Stainless steel tubes shall be ASTM A249. Carbon steel tubes shall be W&D / ASTM A214 & seamless A179. Copper tube temper shall be light annealed with a maximum grain size of 0.040 mm and a maximum hardness of Rockwell 65 on the 15T scale.

Design permits in-tube water velocities up to 6 ft/s for the standard seamless copper tubing, and up to 8 ft/s for optional seamless alloy C70600 cupronickel tubing.

Tubes are to be mechanically expanded to form an interference fit with the fin collars. Coil tube size and wall thickness' are 5/8"x0.020 and 1/2"x0.016 and 1"x.035 standard for copper, with other options available. Steel tubes are offered as 5/8"x0.035 or 0.049.

1.5 HEADERS

Headers shall be constructed from UNS 12200 seamless copper conforming to ASTM B75 and ASTM B251 for standard pressure applications. High pressure construction is to incorporate seamless 90/10 Cupronickel alloy C70600 per ASTM B111. Stainless steel will be constructed of 304L & 316L (ASTM-A240) Sch-5 or Sch-10. Carbon steel headers shall be constructed of Sch-10 (ASTM-A135A) or Sch-40 (ASTM A53A) pipe.

Coil return headers are to be equipped with factory-installed 1/2" fpt air vent connection placed at the highest point available on face of the header.

Tube-to-header holes are to be intruded inward such that the landed surface area is three times the core tube thickness to provide enhanced header to tube joint integrity. all core tubes shall evenly extend within the inside diameter of the header no more than 0.12 inch.

End caps shall be die-formed and installed on the inside diameter of the header such that the landed surface area is three times the header wall thickness.

1.6 CONNECTIONS

Standard construction fluid connections are male pipe thread (MPT) and constructed from red brass conforming to ASTM B43 or Schedule 40 steel pipe as a minimum. Stainless steel will be304L or 316L (ASTM-A240) Sch-40 or Sch 80. Carbon steel will be A53A Sch-40, A106A Sch-40 or Sch-80 or A53B Sch-80 pipe.

1.7 CLEANING

All residual manufacturing oils and solid contaminants are removed internally and externally by completely submersing the coil in an environmentally and safety approved type degreasing solution, which is also chemically compatible with the coil material. This may vary for steel tube coils, depending on the application and/or customer specifications.

1.8 BRAZING

Oxyfuel gas brazing, using fillet rod material of minimum 5% silver, is used for all non-ferrous tube joints to headers and connections. Depending on the application, ferrous to non-ferrous brazing material may contain upwards of 35% silver, or may be Tobin bronze.

1.8.1 WELDING

Gas shielded arc welding is used for welded vessels constructed of stainless steel. Gas welding is used for welded vessels constructed of carbon steel.

1.9 CASING

Casings and endplates shall be made from 16 gauge galvanized steel, meeting ASTM A527 unless otherwise noted. Stainless steel cases shall be constructed of 14 & 16 gauge 304 or 304L & 316 or 316L Stainless Steel 2B Finish (ASTM A240). Carbon steel cases shall be plain steel case (A36). Double-flanged casings on top and bottom of finned height are to be provided to allow stacking of the coils. All sheet metal brakes shall be bent to 90 degrees +/- 2 degrees unless specified otherwise. Coils shall be constructed with intermediate tube/support sheets fabricated from a heavy gauge sheet stock of the same material as the case. One intermediate/tube support shall be provided for each 48" of finned length. Coils over 144" in finned length shall have 4 intermediate/tube supports.

1.10 CERTIFICATION

Performance certified coils that are ARI Standard 410 listed bear the ARI symbol. Coils exceeding the scope of the certification and/or the range of standard rating conditions are also rated to the extent possible by the ARI Std. 410 method. Heatcraft continues as a current and active member of the ARI Air-Cooling and Air-Heating Coils certification program, with original coil line certification and computerized selections dating back to 1969.

1.11 AGENCY APPROVAL

Luvata Grenada LLC was facility registered by UL in 1994 to ISO 9002 (ANSI/ASQC Q92). Applicable commercial coil models are UL Standard 207 registered as Refrigerant Containing Components and Accessories; non-electrical. CRN, category H.

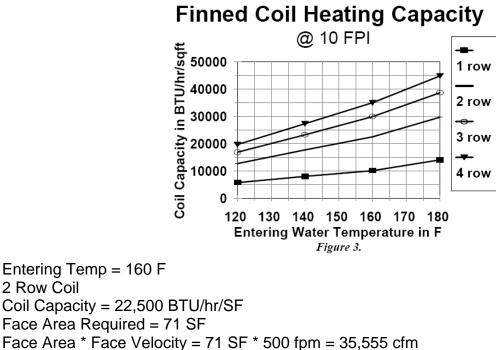
Note: Luvata Grenada LLC can provide ASME code stamped vessels.

1.13 INSTALLATION

Coils to be installed in accordance with manufacturer's instructions and any applicable piping codes.

1.14 LEAD TIME

Heatcraft offers shipment of standard type construction coils in 11-15 days, with reduced lead time emergency shipment options of: 48 hours, 5 days, or 10 days from order placement date.



RS Means Cost Works Assumptions

- Boiler: Steel, gas fired, natural or propane, standard controls Rated 2000 MBH \$12,300
- Coils: Hot water heating coils, copper tubes, aluminum fins, galv. end sheets 5/8" tubing 8 fins per row, 2 rows, rated for 230 PSIG \$425
- Pumps: Water source heat pump, water source to air, single package Rated 50 ton \$600 each

Electric Coils: DH-1 \$360

DH-2 \$655 DH-3 \$550 DH-4 \$510 DH-5 \$690 DH-6 \$410

Appendix C

Boiler Selection



AAE 3000 Natural Gas c/w CSD-1 Gas train Assembly Flame Safeguard and Full Modulation Gas Valve (Control panel enclosure removed for Display)



- A true Two-Pass Flow Design
- Supply and Return can be
- connected from either side.
 Heat exchanger is supplied fully welded by certified ASME welders
- No field assembly required
- No gaskets or push nipples

DEPENDABLE AND ENERGY EFFICIENT PERFORMANCE

For more than fifty years, Allied Engineering has been an innovator in designing outstanding heating products, providing unparalleled customer service and excellent sales support. "AAE Series" boilers include all of the innovations, efficiencies and technologies developed over these years making it one of the most dependable, energy efficient and long life boilers on the market today. Our engineering and development guidelines for quality, ease of operation, simple installation and low capital cost have been achieved.

UNIQUE "DOUBLE PASS" STEEL FINNED TUBE HEAT EXCHANGER

Using the strength and durability of steel tube our engineers have greatly increased the heat transfer surface by continuously welding a spiral fin to each heat exchanger tube. These finned tubes are then welded to headers to form a top or bottom section. The two sections are welded using a 180° riser to complete the unique double pass heat exchanger design. This sturdy light weight design resists thermal shock and plugging of the heat exchanger due to large waterways provided by the 2" OD ASME (SA178A) boiler tube. In addition, the large waterways result in minimal pressure drop through the boiler and can reduce circulator cost. No other boiler combines these features to its' advantage for strength, rigidity, low cost and environmentally friendly construction.

RAPID RESPONSE TIME

The rapid response time of the AAE Series boilers ensure that all "calls for heat" are met promptly. This is of particular importance when used as a heat source for an indirectly fired water heater or a tankless coil.

EASE OF INSTALLATION/OPERATION

Fully assembled "AAE" boilers have a reputation for being simple to install and even simpler to operate and maintain. While we pride ourselves with this simplicity we also offer as options the very latest in sophisticated control systems and direct digital control terminal contacts. If necessary the boiler can be easily dismantled and reassembled to allow passage through narrow aisles and doorways.

VERSATILE BOILER APPLICATIONS

The Super Hot "AAE Series" with its wide range of sizes (480,000 to 3,000,000 Btu/h) has numerous end uses including High Rises, Apartments, Schools, Snow Melt, Hotels and Motels and many other Industrial and Commercial applications. Combine your Super Hot boiler with our "C Series" external indirect copper coils or "EP Series" stainless steel indirect water heaters for years of fast and efficient service of domestic hot water. Ideally suited and easily connected for modular installations.

CSA TESTED FOR MINIMUM EFFICIENCY OF 80%.

STANDARD EQUIPMENT

- Intermittent Electronic Ignition
- Single Stage Gas Valve
- Two Stage Gas Valve
- Redundant Gas Valve
- Temperature/Pressure Gauge
- On/Off Switch with Indicator Light
 Alarm Feature
- Operating Aquastat
- High Limit
- 30 psi A.S.M.E. Pressure Relief Valve
 Combination Seismic Restraint/Lifting Lugs
- 24 Volt Transformer and Fuse
- Draft Hood
- Control Panel Enclosure
- Propane

OPTIONAL EQUIPMENT

Low Water Cut Off

Flame Supervision

Indoor/Outdoor Control

Full Modulation Gas Valve

Higher Pressure A.S.M.E Relief Valves

High/Low Gas Pressure Switches

Auto/Manual Switch

Flow Switch

STAINLESS STEEL ATMOSPHERIC BURNERS

Our computer designed burners are manufactured of high grade heat resistant stainless steel to ensure years of trouble free service, excellent performance and fuel efficiency. The tubular design has virtually eliminated combustion noise.

QUALITY CONTROL

"AAE Series" boilers are manufactured to the American Society of Mechanical Engineers standards. Designed to A.S.M.E. Section IV with a maximum working pressure of 160 psi (1100 kpa) and a maximum operating temperature of 250°F (120°C). Each heat exchanger is tested to 240 psi to ensure leak proof integrity of every boiler leaving the plant. Allied Engineering has a certificate of authorization for use of the "U" stamp for pressure vessels and the "H" stamp for heating boilers which is continually audited by A.S.M.E. and their authorized inspectors.

TEN YEAR LIMITED WARRANTY PROTECTION

Super Hot "AAE Series" boilers are manufactured under the highest standard of quality control, material and workmanship. Our proven design features a ten year warranty on the heat exchanger and one year on all parts and controls. See printed warranty for details. Installation, operating and maintenance instructions are supplied with every boiler.

AAE 1080 Natural Gas c/w High/Low Fire Two Stage Gas Valve (Control panel enclosure removed for Display).

Burner Drawer Assembly with High Grade Stainless Steel Burners

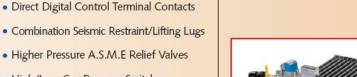
Available in the following codes for controls, safety devices and gas fuel trains.

- ASME CSD-1
- California
- Insurance IRI or FM



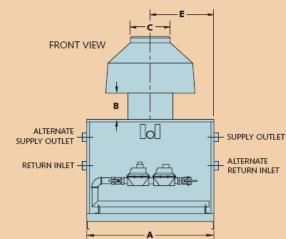


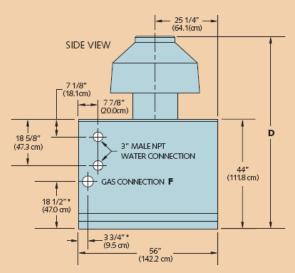






DIMENSIONS AND SPECIFICATIONS



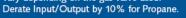


Note: 3" NPT water connections extend 1 1/2" on each side from Boiler Jacket

MODEL	INPUT	OUTPUT	r	D	MA	DI	мв	D	мс	DI	MD	••D	IM E	*GAS CONN F	WA CON		SHIP	
NUMBER	MBH kW	MBH KW	H.P.	in	cm	in	cm	in	cm	in	cm	in	cm	NPT	U.S. GAL.	L	lb	Kg
AAE480 AAE600	480 141 600 176		11.5 14.3		61.0 68.6	10.5 10.5	26.7 26.7	10 10	25.4 25.4	68.9 68.9	175.0 175.0	12.0 13.5	30.5 34.3	1" 1"	5.56 6.75	21.0 25.5	675 725	307 330
AAE720 AAE840	720 211 840 246	576 169	17.2 20.1		76.2 83.8	10.5 10.5	26.7 26.7	12 14	30.5 35.6	71.2 72.9	181.0 185.1	15.0 16.5	38.1 41.9	1" 1"	7.95 9.14	30.1 34.6	790 860	359 391
AAE960 AAE1080	960 281 1080 317	768 225	22.9 25.8	36	91.4 99.0	10.5	26.7 26.7	14 14 16	35.6 40.6	72.9 76.0	185.1 193.0	18.0 19.5	45.7 49.5	1 1/4" 1 1/4"	10.34	39.1 43.6	940 990	427 450
AAE1200	1200 352	960 281	28.7	42	106.7	10.5	26.7	16	40.6	76.0	193.0	21.0	53.3	1 1/4"	12.73	48.2	1050	477
AAE1320 AAE1440	1320 387 1440 422		31.5 34.4		114.3 121.9	10.5 10.5	26.7 26.7	18 18	45.7 45.7	77.3 77.3	196.3 196.3	22.5 24.0	57.2 61.0	1 1/4" 1 1/4"	13.92 15.12		1140 1205	518 548
AAE1560 AAE1680	1560 457 1680 492		37.3 40.1		129.5 137.2	10.5 10.5	26.7 26.7	20	45.7 50.8	77.3 78.7	196.3 199.9	25.5 27.0	64.8 68.6	1 1/4" 1 1/2"	16.31 17.51	61.7 66.3	1270 1350	614
AAE1800 AAE1920	1800 528 1920 563		43.0 45.9		144.8 152.4	10.5 10.5	26.7 26.7	22 22	55.9 55.9	80.7 80.7	205.0 205.0	28.5 30.0	72.4 76.2	1 1/2" 1 1/2"	18.70 19.90	70.8 75.3	1440 1520	655 691
AAE1920 AAE2040	2040 598		45.9 48.7		152.4	10.5	26.7	22	61.0	80.7 82.6	209.8	31.5	76.2 80.0	11/2"	21.09	79.8	1605	730
AAE2160 AAE2280	2160 634 2280 669		51.6 54.5		167.6 175.2	10.5 10.5	26.7 26.7	24 24	61.0 61.0	82.6 82.6	209.8 209.8	33.0 34.5	83.8 87.6	1 1/2" 1 1/2"	22.28 23.48	84.3 88.9	1645 1690	748 768
AAE2400 AAE2495	2400 703 2495 731		57.3 59.6		182.9 190.5	10.5 12.0	26.7 30.5	24 2×18	61.0 2×45.7	82.6 78.8	209.8 200.2	36.0 2x18.25	91.4 2x46.4	1 1/2" 2"	24.67 25.87	93.4 97.9	1770 1850	805 841
AAE2640 AAE2760	2640 774 2760 809	2112 619	63.1 65.9	78	198.1 205.7	12.0	30.5 30.5	2×18	2x45.7 2x45.7	78.8 78.8	200.2	2x19.75 2x20.25	2×50.2	2" 2"	27.06	102.4	1890 1935	859 880
AAE2880 AAE3000	2880 845 3000 880	2304 675	68.8 71.7	84	213.4 221.0	12.0	30.5 30.5	2×18	2x45.7 2x45.7 2x45.7	78.8 78.8	200.2	2x21.00 2x21.75	2×53.3	2" 2"	29.45 30.65	111.5	1975 2020	898 918

** AAE 2495 and larger use two draft hoods. Dimension "E" is

measured from both left and right sides. * Gas Connection "F" shows typical sizes only. Connections may vary depending on the gas valve used.











ALLIED ENGINEERING COMPANY DIVISION OF E-Z-RECT MANUFACTURING LTD.

Manufacturers of Gas and Electric Boilers. Tankless Coils. Electric Boosters 94 Riverside Drive, North Vancouver, B.C. V7H 2M6 • TEL: 604.929.1214 • FAX: 604.929.5184 www.alliedboilers.com

15M 2/04

PRINTED IN CANADA

Pump Selection

Bell & Gossett[®]

System Parameters		
System Flow:	160	U.S. Gallons per Minute (GPM) 🛛 💌
Pump Head:	30	Feet of Water
Pumps in parallel	2 💌	For multiple pumps in parallel, system flow will be split equally.
System Motor Speed		
Motor Speed:	Any RPM / 60 Hz 🛛 💌	
C ESP-Optimized	TM Motor Selection	
Use Non-Overl		
🔘 Select Based o	-	
Minimum HP Req.	None,Let ESP Determine	HP 🔽
System Options Cha	ange Fluid	
Viscosity	31	(SSU)
Specific Gravity	1	
Fluid	water	
Run Selection		
Output Units		
English Units		Select Pumps
O Metric Units		
Pump Series		
Booster Small Circulator 60 In-Line Booster 1" to 1-		
1522 Floor-Mounted Boost		
90 In-Line Close-Coupled		
🔲 1535 Small Close-Couple		
80 In-Line Close Coupled		
80SC In-Line Split Couple		
1510 Base-Mounted End- 1531 Close-Coupled End		
	-Saction Suction, Top-Suction/Top-Disch.	

- □ VSCS Split Case, Double-Suction. Side-Suction/Top-Disch.
 □ VSH Split case, Double-Suction, Side-Suction/Side-Discharge

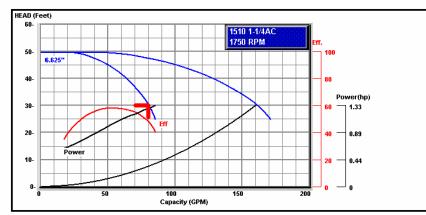
Wastewater Sump, Effluent and Sewage Pumps

Bell & Gossett[®]

					SUMMARY		SUMMARY								
Input Parameters:			: 160.0 gpm		# Pumps: 2		Head: 30 ft	Visc: 31							
PumpSeries	Model	Speed (RPM)	Pump Efficiency	Duty Point	Motor Size	(HP)	Impeller Size (in)	Weight(lbs)							
#1510	1-1/4AC	1750	47.85	1.28	1.5		6.625	160							
1510	1-1/2AC	1750	64.27	0.94	1.5		5.75	170							
1510	2AC	1750	61.19	1	1.5		5.75	180							
1510	2-1/2AB	1750	58.48	1.04	2		5.625	200							
#1510	1-1/2BC	1150	58.15	1.05	1.5		8.5	220							
1510	3AC	1750	42.35	1.45	3		5.875	210							
1510	2BC	1150	64.38	0.95	1.5		8.375	260							
1510	2-1/2BB	1150	60.53	1.01	2		8.25	265							
1510	4AC	1750	30.94	1.99	5		5.875	295							

indicates Single pump operation does not cross system curve. Please consult your local Bell & Gossett representative, or current B&G published technical data, to verify the available maximum working pressure capabilities of the model and size selected.

DETAIL SUMMARY				
Pump Series:	1510	Pump Size:	1-1/4AC	
Flow Rate: (USGPM)	80	Total Head: (ft.)	30	
Pump Speed (RPM)	1750	NPSH req (ft)	7.4	
Weight: (lbs)	160	Cost Index:	100	
Suction Size: (in)	1.5	Suction Velocity (fps)	12.6	
Discharge Size: (in)	1.25	Discharge Velocity: (fps)	17.2	
Impeller Diameter: (in)	6.625	Efficiency: (%)	47.85	
Max Impeller Dia (in)	7.			
Max Flow (USGPM)	86	Duty Flow/Max Flow (%)	0.94	
Flow @ BEP (USGPM)	53	Min. Rec. Flow: (USGPM)	10	
Motor Power, HP:	1.5	Frame Size:	145T	
Pump Power (BHP)	1.28			
Max Power (BHP)	1.33	Aprox Wt (lbs)]	

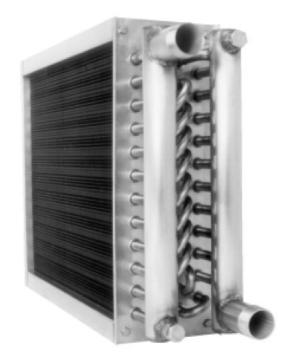


Coil Selection

LUVATA



Fluid Coil Installation Operation and Maintenance

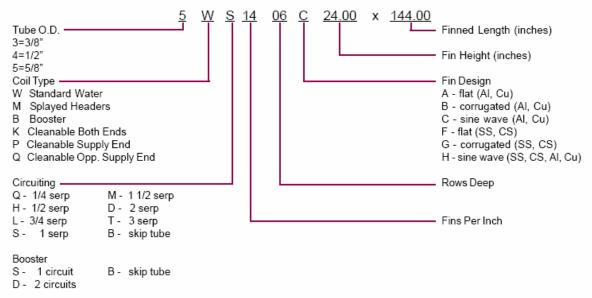


LUVATA GRENADA LLC

PO Box 1457 / 1000 Heatcraft Drive, Grenada, MS 38902-1457 Tel: 800-225-4328 / 662-229-4000 Fax: 662-229-4212 Email: coils@luvata.com Web Site: www.luvata.com/heatcraft Guidelines for the installation, operation and maintenance of Heatcraft cooling and heating coils have been provided to help insure the proper performance of the coils and their longevity. These are general guidelines that may have to be tailored to meet the specific requirements of any one job. As always, the installation and maintenance of any coil should be performed by a qualified party or individual. Protective equipment such as safety glasses, steel toe boots and gloves are recommended during the installation and routine maintenance of the coil.

Receiving Instructions

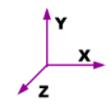
- 1. All Heatcraft coils are factory tested, inspected and carefully packaged.
- Damage to the coils can occur after they have left the factory. Therefore, the coils should be inspected for shipping damage upon receipt. The freight bill should also be checked against items received for complete delivery.
- Damaged and/or missing items should be noted on the carrier's freight bill and signed by the driver.
- 4. For additional assistance, contact your local Heatcraft coil representative.



Nomenclature

Mounting

×	Horizontal Air Flow Horizontal Tubes	Level with the y-axis and x-axis.
	Vertical Air Flow ² Horizontal Tubes	Level with the z-axis and x-axis.
×	Horizontal Air Flow Vertical Tubes	Level with the y-axis and x-axis.

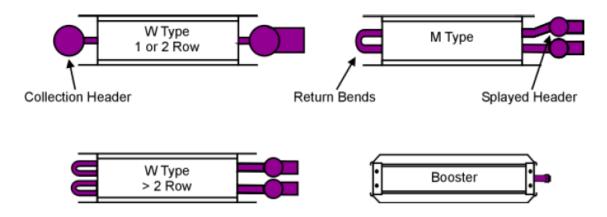


- 1. All Heatcraft water and glycol coils are designed to be fully drainable when properly mounted.
- 2. Vertical air-flow is not recommended for dehumidifying coils.

Coil Types

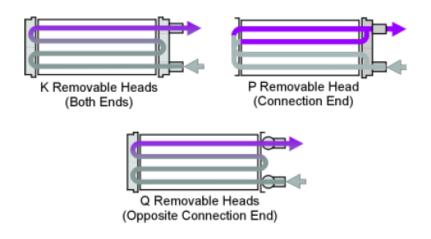
Standard Fluid Coils

Heatcraft fluid coils are specifically designed for your particular application. Flexibility is built into our manufacturing processes, offering variations in fin type, fin density, circuitry arrangement, coil casing and materials of construction. Standard fluid type "W" coils utilize a collection header for one and two row applications and return bends for applications that require three or more rows. Type "M" coils are used for one and two row applications that require same end connections. For type "M" coils the supply and return headers are offset or "splayed." This orientation allows for the supply and return headers to be placed side by side. Booster coils, type "B," are also available for one and two row applications.



Cleanable Fluid Coils

We offer cleanable fluid coils for applications where mechanical cleaning of the internal surface of the tubes are required. Our cleanable coils utilize a box-style head in lieu of cylindrical headers. The head contains baffles for circuiting and is removable for easy access to coil tubes. Type "P" coils are cleanable from the supply end of the coil. Type "Q" coils are cleanable from the end opposite the supply. Type "K" coils are cleanable from both ends of the coil.





FLUID COIL SPECIFICATION

1.0 CERTIFICATION

Acceptable coils are to have ARI Standard 410 certification and bear the ARI symbol. Coils exceeding the scope of the manufacturer's certification and/or the range of ARI's standard rating conditions will be considered provided the manufacturer is a current member of the ARI Air-Cooling and Air-Heating Coils certification program and the coils have been rated in accordance to ARI Standard 410. Manufacturer must be ISO 9002 certified.

1.1 FLUID COIL DESIGN PRESSURES AND TEMPERATURES

Coils shall be designed to withstand 250 psi maximum operating pressures and a maximum fluid temperature of 300°F for standard duty copper tube coils. Optional high pressure construction will include cupronickel tubes and headers to increase maximum operating pressure to 350 psi and maximum operating temperature to 450°F. For cleanable coils with removable heads, coils shall be designed to withstand 100 psi maximum operating pressures and a maximum fluid temperature of 150°F. Higher limits are available, depending on coil construction and/or materials used.

1.2 FACTORY TESTING REQUIREMENTS

Coils shall be submerged in water and tested with a minimum of 315 psi air pressure for standard copper tube coils and 125 psi for cleanable coils with removable heads. A 500 psig hydrostatic and shock test is required for high pressure cupronickel construction. Coils must display a tag with the inspector's identification as proof of testing.

1.3 FINS

Coils shall be of plate fin type construction providing uniform support for all coil tubes. Stainless steel fins shall be constructed of 304 & 316 stainless. Carbon steel fins shall be constructed of ASTM A109-83. Coils are to be manufactured with die-formed aluminum, copper, stainless steel or carbon steel fins with self-spacing collars which completely cover the entire tube surface. The fin thickness shall be 0.0075 +/- 5% unless otherwise specified. Manufacturer must be capable of providing self-spacing die-formed fins 4 through 14 fins/inch with a tolerance of +/- 4%.

1.4 TUBING

Tubing and return bends shall be constructed from UNS 12200 seamless copper conforming to ASTM B75 and ASTM B251 for standard pressure applications. High pressure construction shall use seamless 90/10 Cupronickel alloy C70600 per ASTM B111. Stainless steel tubes shall be ASTM A249. Carbon steel tubes shall be W&D / ASTM A214 & seamless A179. Copper tube temper shall be light annealed with a maximum grain size of 0.040 mm and a maximum hardness of Rockwell 65 on the 15T scale.

Design permits in-tube water velocities up to 6 ft/s for the standard seamless copper tubing, and up to 8 ft/s for optional seamless alloy C70600 cupronickel tubing.

Tubes are to be mechanically expanded to form an interference fit with the fin collars. Coil tube size and wall thickness' are 5/8"x0.020 and 1/2"x0.016 and 1"x.035 standard for copper, with other options available. Steel tubes are offered as 5/8"x0.035 or 0.049.

1.5 HEADERS

Headers shall be constructed from UNS 12200 seamless copper conforming to ASTM B75 and ASTM B251 for standard pressure applications. High pressure construction is to incorporate seamless 90/10 Cupronickel alloy C70600 per ASTM B111. Stainless steel will be constructed of 304L & 316L (ASTM-A240) Sch-5 or Sch-10. Carbon steel headers shall be constructed of Sch-10 (ASTM-A135A) or Sch-40 (ASTM A53A) pipe.

Coil return headers are to be equipped with factory-installed 1/2" fpt air vent connection placed at the highest point available on face of the header.

Tube-to-header holes are to be intruded inward such that the landed surface area is three times the core tube thickness to provide enhanced header to tube joint integrity. all core tubes shall evenly extend within the inside diameter of the header no more than 0.12 inch.

End caps shall be die-formed and installed on the inside diameter of the header such that the landed surface area is three times the header wall thickness.

1.6 CONNECTIONS

Standard construction fluid connections are male pipe thread (MPT) and constructed from red brass conforming to ASTM B43 or Schedule 40 steel pipe as a minimum. Stainless steel will be304L or 316L (ASTM-A240) Sch-40 or Sch 80. Carbon steel will be A53A Sch-40, A106A Sch-40 or Sch-80 or A53B Sch-80 pipe.

1.7 CLEANING

All residual manufacturing oils and solid contaminants are removed internally and externally by completely submersing the coil in an environmentally and safety approved type degreasing solution, which is also chemically compatible with the coil material. This may vary for steel tube coils, depending on the application and/or customer specifications.

1.8 BRAZING

Oxyfuel gas brazing, using fillet rod material of minimum 5% silver, is used for all non-ferrous tube joints to headers and connections. Depending on the application, ferrous to non-ferrous brazing material may contain upwards of 35% silver, or may be Tobin bronze.

1.8.1 WELDING

Gas shielded arc welding is used for welded vessels constructed of stainless steel. Gas welding is used for welded vessels constructed of carbon steel.

1.9 CASING

Casings and endplates shall be made from 16 gauge galvanized steel, meeting ASTM A527 unless otherwise noted. Stainless steel cases shall be constructed of 14 & 16 gauge 304 or 304L & 316 or 316L Stainless Steel 2B Finish (ASTM A240). Carbon steel cases shall be plain steel case (A36). Double-flanged casings on top and bottom of finned height are to be provided to allow stacking of the coils. All sheet metal brakes shall be bent to 90 degrees +/- 2 degrees unless specified otherwise. Coils shall be constructed with intermediate tube/support sheets fabricated from a heavy gauge sheet stock of the same material as the case. One intermediate/tube support shall be provided for each 48" of finned length. Coils over 144" in finned length shall have 4 intermediate/tube supports.

1.10 CERTIFICATION

Performance certified coils that are ARI Standard 410 listed bear the ARI symbol. Coils exceeding the scope of the certification and/or the range of standard rating conditions are also rated to the extent possible by the ARI Std. 410 method. Heatcraft continues as a current and active member of the ARI Air-Cooling and Air-Heating Coils certification program, with original coil line certification and computerized selections dating back to 1969.

1.11 AGENCY APPROVAL

Luvata Grenada LLC was facility registered by UL in 1994 to ISO 9002 (ANSI/ASQC Q92). Applicable commercial coil models are UL Standard 207 registered as Refrigerant Containing Components and Accessories; non-electrical. CRN, category H.

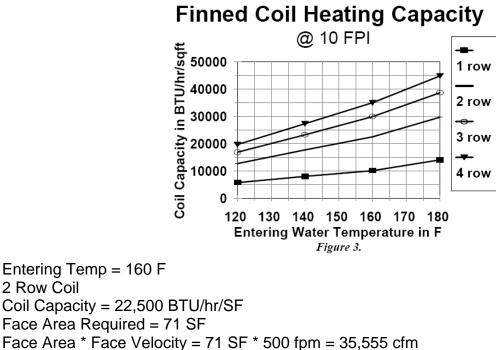
Note: Luvata Grenada LLC can provide ASME code stamped vessels.

1.13 INSTALLATION

Coils to be installed in accordance with manufacturer's instructions and any applicable piping codes.

1.14 LEAD TIME

Heatcraft offers shipment of standard type construction coils in 11-15 days, with reduced lead time emergency shipment options of: 48 hours, 5 days, or 10 days from order placement date.



RS Means Cost Works Assumptions

- Boiler: Steel, gas fired, natural or propane, standard controls Rated 2000 MBH \$12,300
- Coils: Hot water heating coils, copper tubes, aluminum fins, galv. end sheets 5/8" tubing 8 fins per row, 2 rows, rated for 230 PSIG \$425
- Pumps: Water source heat pump, water source to air, single package Rated 50 ton \$600 each

Electric Coils: DH-1 \$360

DH-2 \$655 DH-3 \$550 DH-4 \$510 DH-5 \$690 DH-6 \$410