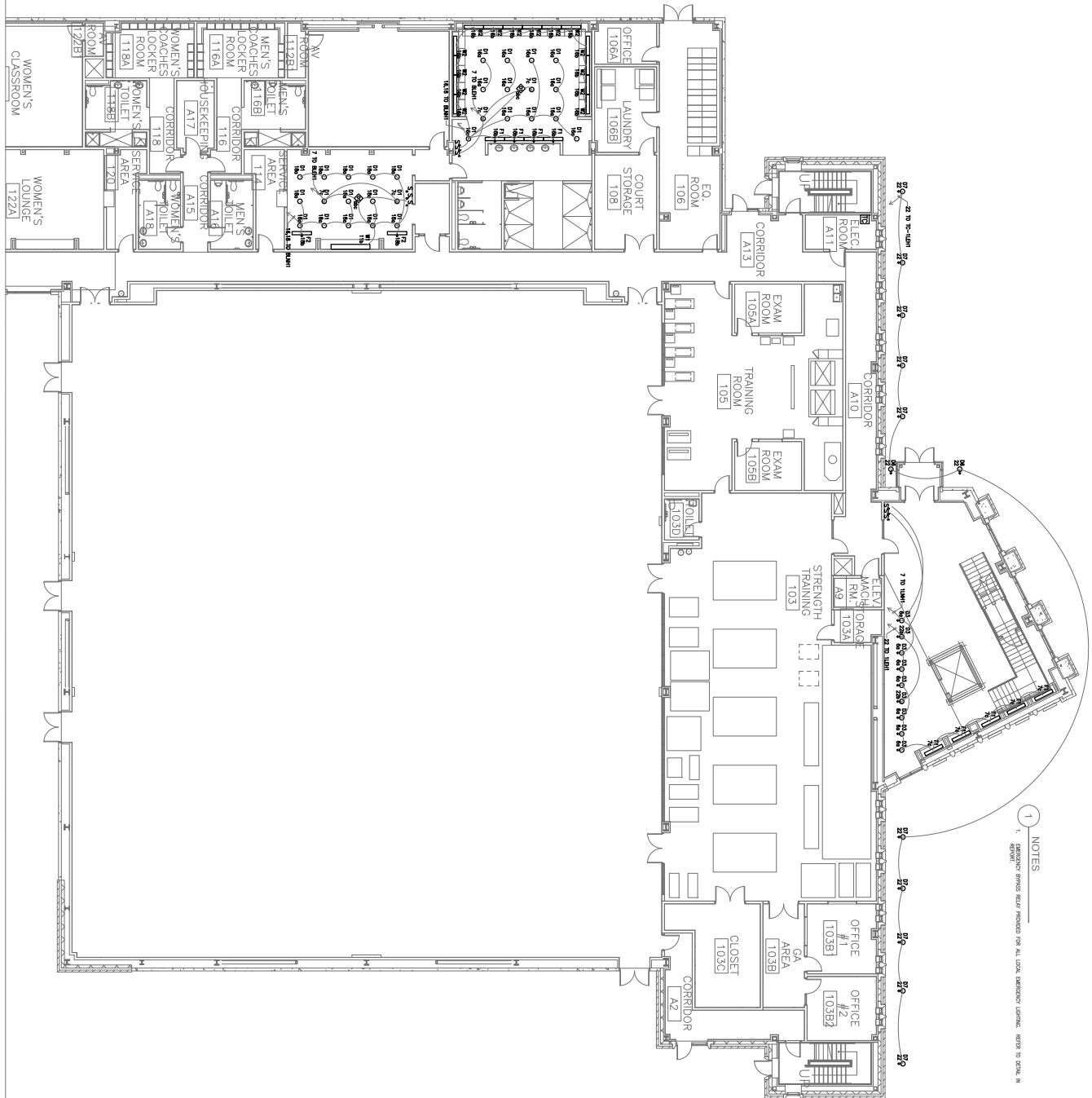
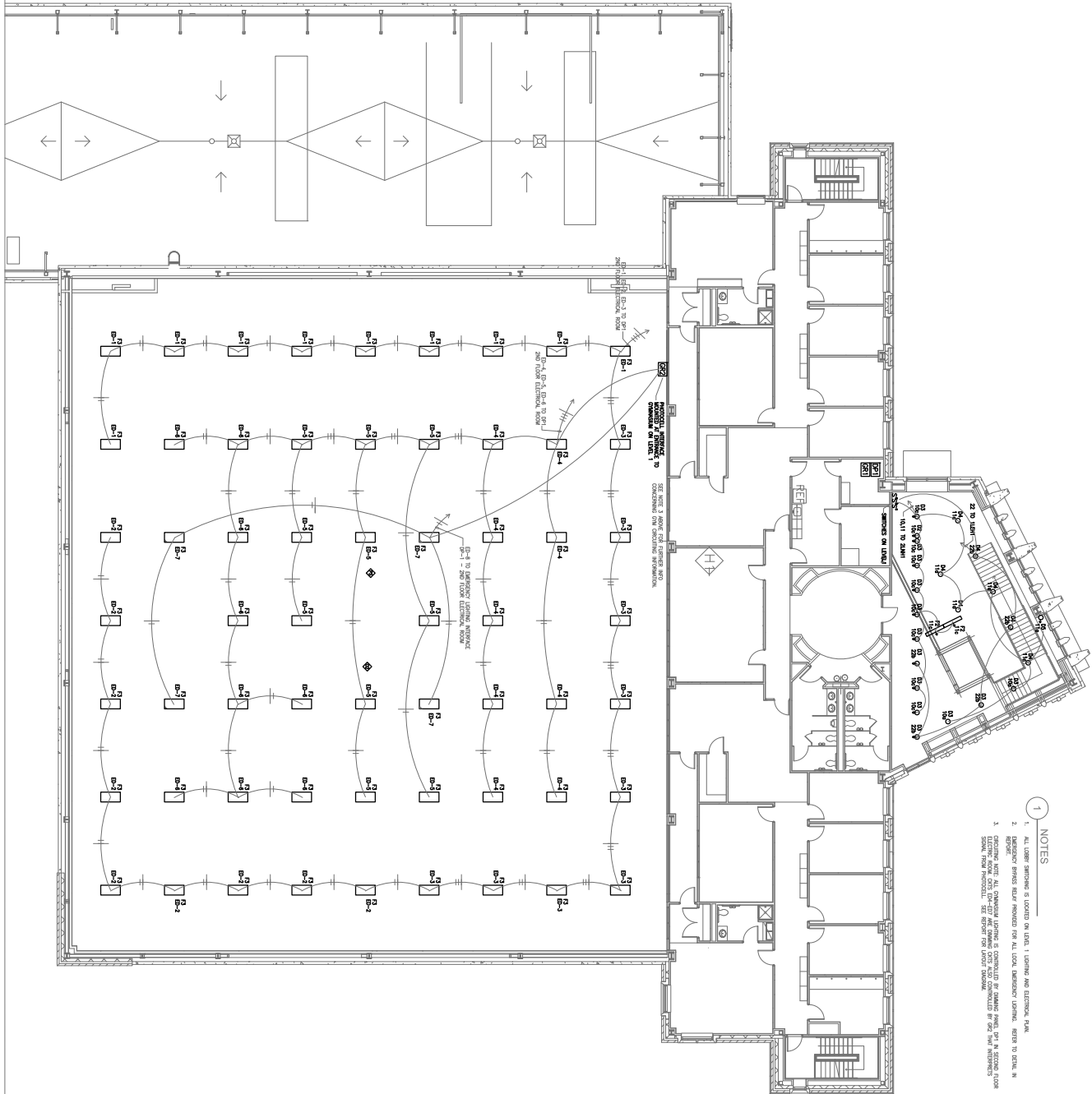


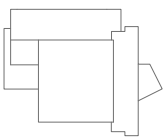


1. NOTES
1. EMERGENCY EVACUATION ROUTES ARE SHOWN FOR ALL LOCAL EMERGENCY SERVICES. REFER TO DETAIL IN SECTION.



NOTES

1. ALL LIGHTING IS LOCATED ON LEVEL 2. LIGHTING AND ELECTRICAL PLAN.
2. LIGHTING FIXTURES ARE RELAY POWERED FOR ALL LOCAL LIGHTING. LIGHTING, REFER TO SECOND FLOOR ELECTRICAL PLAN FOR RELAY POWERING.
3. LIGHTING FIXTURES ARE CONTROLLED BY REMOTE PANEL, SPOT, IN SECOND FLOOR ELECTRICAL PLAN. SEE REMOTE FOR LIGHTING FIXTURES.



Level 2 Plan

AE 4827 W. Senior Project
Final Report
Daniel Moynagh
141 South Allen Street
Salt Collage, PA 16801
Drawing Title
Level 2 Lighting and
Electrical Plan
Date
April 2, 2010
Scale
1/8" = 1'-0"

Appendix B

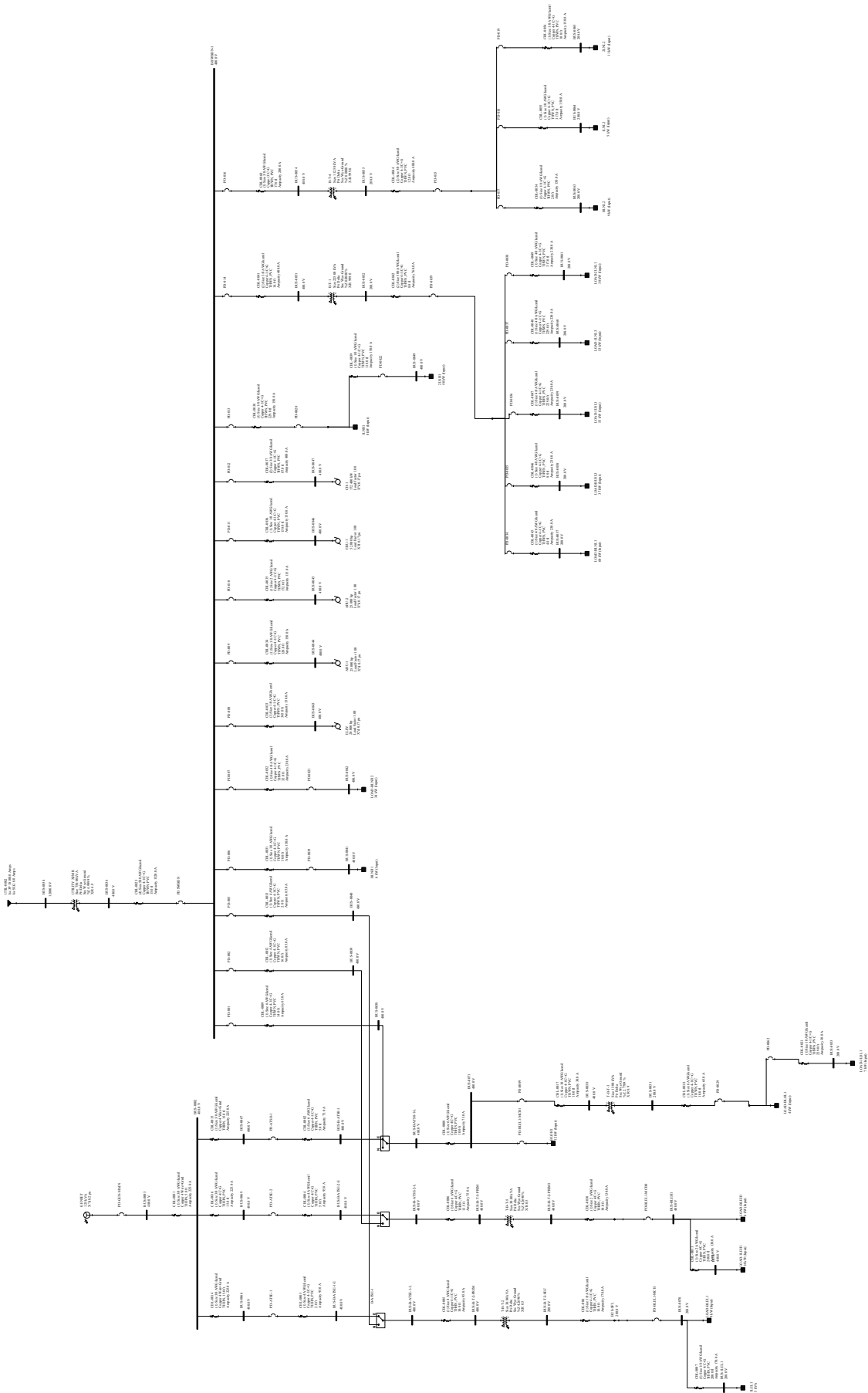
Luminaire and Controls Schedule

Type		Manufacturer	Product Name	Catalog Number	Description	Lamp	Voltage	Ballast/Power Supply	Watts	Location
D1		Erco	Quintessence Double Washlight	47655.000	Axially symmetrical downlight for uniform wall washing. Bright anodised aluminum reflector. Translucent, plastic wide diffuser.	Osram Sylvania CF32DT/E/IN/841/ECO	277	ICF-2526-H1-LD@277 Advance CFL Ballast	36	Lounge and Locker Room Ceiling Recessed
D2		Erco	Quintessence Recessed Spotlight	46459.000	Adjustable recessed spotlight. Adjustable cast aluminium reflector, 0° - 40° tilt, 360° rotation. Lockable angles of tilt and rotation.	Philips MasterColor CDM-TC 35W/842 T4 CL	277	MH-P39-G Advance Electronic MH Ballast	45	Lobby
D3		Erco	Quintessence Washlight	46672.000	Axially symmetrical downlight for uniform wall washing. Bright anodised aluminum reflector. Translucent, plastic wide diffuser.	(2) Osram Sylvania CF32DT/E/IN/841/ECO	277	ICF-2542-M2-BS@ 277 Advance CFL Ballast	68	Lobby
D4		Erco	Quintessence Downlight	47406.000	Axially symmetrical downlight . Spherolit technology upper reflector. Narrow frosted glass diffuser.	Philips MasterColor CDM-TC 35W/842 T4 CL	277	MH-P39-G Advance Electronic MH Ballast	45	Lobby
D5		Erco	Optec Spotlight	72030.000	Surface mounted spotlight. Cast aluminum cylindrical light head. 180° tilt. Aluminum, silver-mirror finished anodized.	Philips MasterColor CDM-TC 35W/842 T4 CL	277	MH-P39-G Advance Electronic MH Ballast	45	Lobby
D6		Erco	Tesis In-ground Luminaire	33704.000	Round in-grade lensed wallwasher. Corrosion resistant cast aluminium housing.	Philips MasterColor CDM-TC 20W/842 T4 CL	277	IMH-G20-E-277 Advance Electronic MH Ballast	24	Façade
D7		Erco	Tesis In-ground Luminaire	33715.000	Round in-grade lensed wallwasher. Corrosion resistant cast aluminium housing.	Philips MasterColor CDM-TC 35W/842 T4 CL	277	MH-P39-G Advance Electronic MH Ballast	45	Façade
F1		LiteControl	Wall/Slot 2000	2046T8-CWM-ELB10-120	Ceiling recessed wall/slot luminaire. Extruded white aluminum with curved die-formed specular aluminum reflector. 1 lamp per 4' section.	Osram Sylvania FO32/835/XPS/ECO	277	ICN-2P32-N @ 277V Advance Ballast	36	Locker room, Lobby
F2		Erco	TFL Wallwasher	65040.000	Asymmetrical linear wallwasher. Anodized silver aluminum reflector.	Osram Sylvania FP28/835/ECO	277	ICN-2528-N@277 Advance Ballast	31	Lounge, Lobby
F3		Lithonia	Spec-Beam Full Sided Fluorescent High Bay	FGB21 6 54T5HO T1x20 MVOLT 3/2 GEB10PS LP841	Fluorescent high bay luminaire. Aluminum reflector whit upright slots.	GE F54W/T5/841/ECO	277	(3) Advance IDA-2554@277 Electronic Dimming Ballast	(3) 124	Gymnasium
W1		Cold Cathode Lighting Systems	Flexible Cathode Light Strip	FLCS-11-C-35TC-277	Satin-anodized aluminum luminaire connected with flexible cable.	T6 cold cathode fluorescent 3500K	277	Integral cold cathode ballast	13.7 W/ft	Wall mounted behind VT logo in lounge
W2		Cold Cathode Lighting Systems	Standard-Output Ballast Operated Cold Cathode	BNP-S-35TC-277	Satin-anodized aluminum luminaire connected with flexible cable.	T8 Cold Cathode lamp	277	Integral cold cathode ballast	6.6 W/ft	Lounge and Locker Room

Type		Manufacturer	Product Name	Catalog Number	Description
O1		Lutron	Infrared Ceiling Mount Sensor	LOS-CIR-450-WH	Ceiling mounded passive infrared occupancy sensor providing 1500 sq.ft. coverage.
O2		Lutron	Infrared Ceiling Mount Sensor	LOS-CIR-1500-WH	Ceiling mounded passive infrared occupancy sensor providing 450 sq.ft. coverage.
TC		WattStopper	Astronomic Time Clock	MSC-100	Five channel clock used for fully automating a lighting control system.
DP1		Lutron	GP Dimming Panel	CGP8-2774T8-ML-20-CGP344	277/480V 3Φ/4W 8 circuit dimming panel. Max input feed of 60A
GR1		Lutron	Grafik Eye 4000 Series	GRX-4108-T-WH	Main control unit for gymnasium daylight dimming system.
GR2		Lutron	Automatic Daylighting Control	GRX-DACPI	Low voltage control interface for daylight dimming system.
EL1		Lutron	Emergency Lighting Interface	LUT-ELI-3PH	Control device that senses when normal power is lost and restores designated luminaires to emergency lighting setting.
PS		Lutron	microPS Daylight Sensor	MW-PS-WH	Photocell for daylight harvesting.

Appendix C

SKM Systems Analysis



VIRGINIA TECH
EMERGENCY SYSTEM POWER STUDY
GENERATOR CONTRIBUTION

Mar 17, 2010 12:37:42

ALL INFORMATION PRESENTED IS FOR REVIEW, APPROVAL
INTERPRETATION AND APPLICATION BY A REGISTERED ENGINEER ONLY
SKM DISCLAIMS ANY RESPONSIBILITY AND LIABILITY RESULTING
FROM THE USE AND INTERPRETATION OF THIS SOFTWARE.

SKM POWER*TOOLS FOR WINDOWS
SHORT CIRCUIT ANALYSIS REPORT
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Mar 17, 2010 12:37:42
PAGE 2
VIRGINIA TECH
EMERGENCY SYSTEM POWER STUDY
GENERATOR CONTRIBUTION

ALL PU VALUES ARE EXPRESSED ON A 100 MVA BASE

SWING GENERATORS		
SOURCE NAME	VOLTAGE	ANGLE
=====		
UTIL-0002	1.00	0.00

Mar 17, 2010 12:37:42
 PAGE 3
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

***** P R E - F A U L T V O L T A G E P R O F I L E

BUS#	NAME	BASE VOLTS	PU VOLTS	ANGLE (D)
B-SWBDN-1		480.00	1.0000	-30.
BUS-		480.00	1.0000	-60.
BUS-0030		480.00	1.0000	-30.
BUS-0031		208.00	1.0000	-60.
BUS-0032		208.00	1.0000	-60.
BUS-0033		208.00	1.0000	-60.
BUS-0034		12000.00	1.0000	0.
BUS-0036		480.00	1.0000	-30.
BUS-0038		480.00	1.0000	-30.
BUS-0039		480.00	1.0000	-30.
BUS-0040		480.00	1.0000	-30.
BUS-0041		480.00	1.0000	-30.
BUS-0042		480.00	1.0000	-30.
BUS-0043		480.00	1.0000	-30.
BUS-0044		480.00	1.0000	-30.
BUS-0045		480.00	1.0000	-30.
BUS-0046		480.00	1.0000	-30.
BUS-0047		480.00	1.0000	-30.
BUS-0048		480.00	1.0000	-30.
BUS-0049		480.00	1.0000	-30.
BUS-0051		480.00	1.0000	-30.
BUS-0052		208.00	1.0000	-60.
BUS-0054		480.00	1.0000	-30.
BUS-0055		208.00	1.0000	-60.
BUS-0057		208.00	1.0000	-60.
BUS-0058		208.00	1.0000	-60.
BUS-0059		208.00	1.0000	-60.
BUS-0060		208.00	1.0000	-60.
BUS-0061		208.00	1.0000	-60.
BUS-0062		208.00	1.0000	-60.
BUS-0063		208.00	1.0000	-60.
BUS-0064		208.00	1.0000	-60.
BUS-0065		208.00	1.0000	-60.
BUS-0070		208.00	1.0000	-60.
BUS-0071		480.00	1.0000	-30.
BUS-1LEL1		208.00	1.0000	-60.
BUS-B-ATS0-1-L		480.00	1.0000	-30.
BUS-B-ATSE-1-L		480.00	1.0000	-30.
BUS-B-ATSE-2-L		480.00	1.0000	-30.
BUS-B-T-2-PRIM		480.00	1.0000	-30.
BUS-B-T-2-PRIM		480.00	1.0000	-60.
BUS-B-T-2-SEC		208.00	1.0000	-60.
BUS-B-T-5-PRIM		480.00	1.0000	-30.
BUS-BLEH1		480.00	1.0000	-60.

Mar 17, 2010 12:37:42
PAGE 4
VIRGINIA TECH
EMERGENCY SYSTEM POWER STUDY
GENERATOR CONTRIBUTION

***** P R E - F A U L T V O L T A G E P R O F I L E

BUS#	NAME	BASE VOLTS	PU VOLTS	ANGLE (D)
	BUS-BPNL1	208.00	1.0000	-60.
	BUS-SFL	208.00	1.0000	-60.
	BUS-SFL 2	480.00	1.0000	-60.

Mar 17, 2010 12:37:42
 PAGE 5
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

***** F A U L T A N A L Y S I S R E P O R T

FAULT TYPE: 3PH
 MODEL INDUCTION MOTOR CONTRIBUTION: YES
 MODEL TRANSFORMER TAPS: YES
 MODEL TRANSFORMER PHASE SHIFT: YES

=====

B-SWBDN-1 VOLTAGE BASE LL: 480.0 (VOLTS)
 AMPS/DEG) INI. SYM. RMS FAULT CURRENT: 19645.3 / -109. (

THEVENIN EQUIVALENT IMPEDANCE: 1.171 +j 6.010 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 5.131

	ASYM 1/2 CYCLES	RMS 2 CYCLES	INTERRUPTING AMPS 3 CYCLES	5 CYCLES	8
CYCLES	24754.8	19791.3	19657.9	19645.3	
19645.3					

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES

---	PHASE A---	---	PHASE B---	---	PHASE C---
0.0000 /	0.0	0.0000 /	0.0	0.0000 /	0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES

---	PHASE A---	---	PHASE B---	---	PHASE C---
19645.3 /	-109.0	19645.2 /	131.0	19645.2 /	11.0

B-SWBDN-1
 =====

==== INI. SYM. RMS SYSTEM BUS VOLTAGES (PU / DEG)

	FIRST BUS FROM FAULT ---	PHASE A---	AT TIME = ---	PHASE B---	0.5 CYCLES ---	PHASE C---
C---						
BUS-0036	480.0	0.0108 / -55.	0.0108 /	-175.	0.0108 /	65.
BUS-0038	480.0	0.0000 / 0.	0.0000 /	0.	0.0000 /	0.
BUS-0039	480.0	0.0000 / 0.	0.0000 /	0.	0.0000 /	0.
BUS-0040	480.0	0.0000 / 0.	0.0000 /	0.	0.0000 /	0.
BUS-0041	480.0	0.0000 / 0.	0.0000 /	0.	0.0000 /	0.
BUS-0042	480.0	0.0000 / 0.	0.0000 /	0.	0.0000 /	0.
BUS-0043	480.0	0.0242 / -90.	0.0242 /	150.	0.0242 /	30.
BUS-0044	480.0	0.0106 / -91.	0.0106 /	149.	0.0106 /	29.
BUS-0045	480.0	0.0229 / -97.	0.0229 /	143.	0.0229 /	23.
BUS-0046	480.0	0.0288 / -90.	0.0288 /	150.	0.0288 /	30.
BUS-0047	480.0	0.0243 / -80.	0.0243 /	160.	0.0243 /	40.
BUS-0048	480.0	0.0000 / 0.	0.0000 /	0.	0.0000 /	0.
BUS-0051	480.0	0.0000 / 0.	0.0000 /	0.	0.0000 /	0.
BUS-0054	480.0	0.0000 / 0.	0.0000 /	0.	0.0000 /	0.

Mar 17, 2010 12:37:42
 PAGE 6
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

B-SWBDN-1 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====

		FIRST BUS FROM FAULT	AT TIME =
0.5 CYCLES			
PHASE B-	-PHASE C-	BRANCH NAME	VBASE LL -PHASE A- -
BUS-0036	B-SWBDN-1	CBL-0023	480. 17182.9/-108.
17182.9/ 132.	17182.9/ 12.		
B-SWBDN-1	BUS-0038	CBL-0009	480. 0.0/ 0.
0.0/ 0.	0.0/ 0.		
B-SWBDN-1	BUS-0039	CBL-0012	480. 0.0/ 0.
0.0/ 0.	0.0/ 0.		
B-SWBDN-1	BUS-0040	CBL-0013	480. 0.0/ 0.
0.0/ 0.	0.0/ 0.		
B-SWBDN-1	BUS-0041	CBL-0031	480. 0.0/ 0.
0.0/ 0.	0.0/ 0.		
B-SWBDN-1	BUS-0042	CBL-0032	480. 0.0/ 0.
0.0/ 0.	0.0/ 0.		
B-SWBDN-1	BUS-0043	CBL-0033	480. 140.2/ 67.
140.2/ -53.	140.2/-173.		
B-SWBDN-1	BUS-0044	CBL-0034	480. 176.4/ 66.
176.4/ -54.	176.4/-174.		
B-SWBDN-1	BUS-0045	CBL-0035	480. 175.8/ 67.
175.8/ -53.	175.8/-173.		
B-SWBDN-1	BUS-0046	CBL-0036	480. 363.6/ 67.
363.6/ -53.	363.6/-173.		
B-SWBDN-1	BUS-0047	CBL-0037	480. 1614.0/ 67.
1614.0/ -53.	1614.0/-173.		
B-SWBDN-1	BUS-0048	CBL-0038	480. 0.0/ 0.
0.0/ 0.	0.0/ 0.		
B-SWBDN-1	BUS-0051	CBL-0041	480. 0.0/ 0.
0.0/ 0.	0.0/ 0.		
B-SWBDN-1	BUS-0054	CBL-0060	480. 0.0/ 0.
0.0/ 0.	0.0/ 0.		

Mar 17, 2010 12:37:42
 PAGE 7
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS- VOLTAGE BASE LL: 480.0 (VOLTS)
 AMPS/DEG) INI. SYM. RMS FAULT CURRENT: 710.2 / -88. (
 THEVENIN EQUIVALENT IMPEDANCE: 149.888 +j 78.865 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 0.526

	ASYM 1/2 CYCLES	RMS 2 CYCLES	INTERRUPTING AMPS 3 CYCLES	5 CYCLES	8
CYCLES	710.2	710.2	710.2	710.2	
710.2					

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 710.2 / -87.8 710.2 / 152.2 710.2 / 32.2

BUS- =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 BUS-BLEH1 480.0 0.1060 / -75. 0.1060 / 165. 0.1060 / 45.
 BUS- ===== INI. RMS SYSTEM BRANCH FLOWS (
 AMPS) =====

	FIRST BUS FROM FAULT	AT TIME =
0.5 CYCLES		
PHASE B- -PHASE C-	BRANCH NAME	VBASE LL -PHASE A- -
BUS-BLEH1 BUS-	CBL-0011	480. 710.2/ -88.
710.2/ 152. 710.2/ 32.		

Mar 17, 2010 12:37:42
 PAGE 8
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0030 VOLTAGE BASE LL: 480.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 8866.7 / -61. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 11.605 +j 7.024 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 0.605

	ASYM 1/2 CYCLES	RMS 2 CYCLES	INTERRUPTING AMPS 3 CYCLES	5 CYCLES	8
CYCLES	8867.0	8866.7	8866.7	8866.7	
8866.7					

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 8866.7 / -61.2 8866.7 / 178.8 8866.7 / 58.8

BUS-0030 =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 BUS-0031 208.0 0.0000 / 0. 0.0000 / 0. 0.0000 / 0.
 BUS-0071 480.0 0.3785 / -57. 0.3785 / -177. 0.3785 / 63.
 BUS-0030 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====

	FIRST BUS FROM FAULT	AT TIME =
0.5 CYCLES		
PHASE B- -PHASE C-	BRANCH NAME	VBASE LL -PHASE A- -
BUS-0030 BUS-0031	T-B-T-3	480. 0.0/ 0.
0.0/ 0. 0.0/ 0.		
BUS-0071 BUS-0030	CBL-0017	480. 8866.7/ -61.
8866.7/ 179. 8866.7/ 59.		

Mar 17, 2010 12:37:42
 PAGE 9
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0031 VOLTAGE BASE LL: 208.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 1397.3 / -100. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 151.605 +j 128.358 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 0.847

	ASYM 1/2 CYCLES	RMS 2 CYCLES	INTERRUPTING AMPS 3 CYCLES	5 CYCLES	8
CYCLES	1398.2	1397.3	1397.3	1397.3	
1397.3					

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 1397.3 / -100.3 1397.3 / 139.7 1397.3 / 19.7

BUS-0031 =====
 ===== INI. SYM. RMS SYSTEM BUS VOLTAGES (PU / DEG)

	FIRST BUS FROM FAULT ---PHASE A---	AT TIME = ---PHASE B---	0.5 CYCLES ---PHASE C---
C---			
BUS-0030	480.0 0.9326 / -29.	0.9326 / -149.	0.9326 / 91.
BUS-0032	208.0 0.0000 / 0.	0.0000 / 0.	0.0000 / 0.
BUS-0031	===== INI.	RMS	SYSTEM BRANCH FLOWS (

AMPS) =====
 FIRST BUS FROM FAULT AT TIME =
 0.5 CYCLES

PHASE B-	-PHASE C-	BRANCH NAME	VBASE LL	-PHASE A-	-
BUS-0030	BUS-0031	T-B-T-3	480.	605.5/ -70.	
605.5/ 170.	605.5/ 50.	CBL-0018	208.	0.0/ 0.	
BUS-0031	BUS-0032				
0.0/ 0.	0.0/ 0.				

Mar 17, 2010 12:37:42
 PAGE 10
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0033 VOLTAGE BASE LL: 208.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 344.0 / -72. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 787.977 +j 173.186 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 0.220

	ASYM 1/2 CYCLES	RMS 2 CYCLES	INTERRUPTING AMPS 3 CYCLES	5 CYCLES	8
CYCLES	344.0	344.0	344.0	344.0	
344.0					

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 344.0 / -72.4 344.0 / 167.6 344.0 / 47.6

BUS-0033
 =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 BUS-0032 208.0 0.7760 / -68. 0.7760 / 172. 0.7760 / 52.
 BUS-0033 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====
 FIRST BUS FROM FAULT AT TIME =
 0.5 CYCLES
 BRANCH NAME VBASE LL -PHASE A- -
 PHASE B- -PHASE C-
 BUS-0032 BUS-0033 CBL-0021 208. 344.0/ -72.
 344.0/ 168. 344.0/ 48.

Mar 17, 2010 12:37:42
 PAGE 11
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0034 VOLTAGE BASE LL: 12000.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 18186.8 / -83. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 0.033 +j 0.263 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 7.998
 ASYM RMS INTERRUPTING AMPS
 1/2 CYCLES 2 CYCLES 3 CYCLES 5 CYCLES 8
 CYCLES
 25146.1 18956.0 18349.3 18193.9
 18186.9

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 18186.8 / -82.9 18186.8 / 157.1 18186.8 / 37.1

BUS-0034 =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 BUS-0036 480.0 0.1203 / -34. 0.1203 / -154. 0.1203 / 86.
 BUS-0034 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====

FIRST BUS FROM FAULT AT TIME =
 0.5 CYCLES
 BRANCH NAME VBASE LL -PHASE A- -
 PHASE B- -PHASE C-
 UTIL-0002 BUS-0034 12000. 18100.0/ -83.
 18100.0/ 157. 18100.0/ 37.
 BUS-0034 BUS-0036 UTILITY XFMR 12000. 86.8/ 97.
 86.8/ -23. 86.8/-143.

Mar 17, 2010 12:37:42
 PAGE 12
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0036 VOLTAGE BASE LL: 480.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 19812.5 / -109. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 1.139 +j 5.963 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 5.238
 ASYM RMS INTERRUPTING AMPS
 1/2 CYCLES 2 CYCLES 3 CYCLES 5 CYCLES 8
 CYCLES
 25081.6 19975.2 19827.4 19812.7
 19812.5

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 19812.5 / -109.2 19812.5 / 130.8 19812.5 / 10.8

BUS-0036 =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 BUS-0034 12000.0 0.9618 / 0. 0.9618 / -120. 0.9618 / 120.
 B-SWBDN-1 480.0 0.0015 / -60. 0.0015 / -180. 0.0015 / 60.
 BUS-0036 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====

FIRST BUS FROM FAULT AT TIME =
 0.5 CYCLES
 BRANCH NAME VBASE LL -PHASE A- -
 PHASE B- -PHASE C-
 BUS-0034 BUS-0036 UTILITY XFMR 12000. 694.1/ -79.
 694.1/ 161. 694.1/ 41.
 BUS-0036 B-SWBDN-1 CBL-0023 480. 2466.6/ 67.
 2466.6/ -53. 2466.6/ -173.

Mar 17, 2010 12:37:42
 PAGE 13
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0038 VOLTAGE BASE LL: 480.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 15590.0 / -86. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 4.270 +j 6.426 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 1.505
 ASYM RMS INTERRUPTING AMPS
 1/2 CYCLES 2 CYCLES 3 CYCLES 5 CYCLES 8
 CYCLES
 15827.8 15590.0 15590.0 15590.0
 15590.0

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 15590.0 / -86.4 15590.0 / 153.6 15590.0 / 33.6

BUS-0038 =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 BUS-B-ATSO-1-L 480.0 0.0000 / 0. 0.0000 / 0. 0.0000 / 0.
 B-SWBDN-1 480.0 0.4053 / -79. 0.4053 / 161. 0.4053 / 41.
 BUS-0038 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====

FIRST BUS FROM FAULT AT TIME =
 0.5 CYCLES
 BRANCH NAME VBASE LL -PHASE A- -
 PHASE B- -PHASE C-
 BUS-0038 BUS-B-ATSO-1-L B-ATSE-3 480. 0.0/ 0.
 0.0/ 0. 0.0/ 0.
 B-SWBDN-1 BUS-0038 CBL-0009 480. 15590.0/ -86.
 15590.0/ 154. 15590.0/ 34.

Mar 17, 2010 12:37:42
 PAGE 14
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0039 VOLTAGE BASE LL: 480.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 16499.3 / -92. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 3.400 +j 6.448 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 1.896
 ASYM RMS INTERRUPTING AMPS
 1/2 CYCLES 2 CYCLES 3 CYCLES 5 CYCLES 8
 CYCLES
 17089.3 16499.3 16499.3 16499.3
 16499.3

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 16499.3 / -92.2 16499.3 / 147.8 16499.3 / 27.8

BUS-0039 =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 BUS-B-ATSE-2-L 480.0 0.0000 / 0. 0.0000 / 0. 0.0000 / 0.
 B-SWBDN-1 480.0 0.3117 / -81. 0.3117 / 159. 0.3117 / 39.
 BUS-0039 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====

FIRST BUS FROM FAULT AT TIME =
 0.5 CYCLES
 BRANCH NAME VBASE LL -PHASE A- -
 PHASE B- -PHASE C-
 BUS-0039 BUS-B-ATSE-2-L B-ATSE-2 480. 0.0/ 0.
 0.0/ 0. 0.0/ 0.
 B-SWBDN-1 BUS-0039 CBL-0012 480. 16499.3/ -92.
 16499.3/ 148. 16499.3/ 28.

Mar 17, 2010 12:37:42
 PAGE 15
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0040 VOLTAGE BASE LL: 480.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 19290.2 / -107. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 1.450 +j 6.064 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 4.183
 ASYM RMS INTERRUPTING AMPS
 1/2 CYCLES 2 CYCLES 3 CYCLES 5 CYCLES 8
 CYCLES
 23191.0 19337.5 19292.5 19290.2
 19290.2

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 19290.2 / -106.6 19290.2 / 133.4 19290.2 / 13.4

BUS-0040 =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 BUS-B-ATSE-1-L 480.0 0.0000 / 0. 0.0000 / 0. 0.0000 / 0.
 B-SWBDN-1 480.0 0.0455 / -95. 0.0455 / 145. 0.0455 / 25.
 BUS-0040 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====

FIRST BUS FROM FAULT AT TIME =
 0.5 CYCLES
 BRANCH NAME VBASE LL -PHASE A- -
 PHASE B- -PHASE C-
 BUS-0040 BUS-B-ATSE-1-L B-ATSE-1 480. 0.0/ 0.
 0.0/ 0. 0.0/ 0.
 B-SWBDN-1 BUS-0040 CBL-0013 480. 19290.2/-107.
 19290.2/ 133. 19290.2/ 13.

Mar 17, 2010 12:37:42
 PAGE 16
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0041 VOLTAGE BASE LL: 480.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 16504.2 / -97. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 2.838 +j 6.713 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 2.365
 ASYM RMS INTERRUPTING AMPS
 1/2 CYCLES 2 CYCLES 3 CYCLES 5 CYCLES 8
 CYCLES
 17624.9 16504.6 16504.2 16504.2
 16504.2

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 16504.2 / -97.1 16504.1 / 142.9 16504.2 / 22.9

BUS-0041 =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 B-SWBDN-1 480.0 0.2482 / -74. 0.2482 / 166. 0.2482 / 46.
 BUS-0041 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====
 FIRST BUS FROM FAULT AT TIME =
 0.5 CYCLES
 BRANCH NAME VBASE LL -PHASE A- -
 PHASE B- -PHASE C-
 B-SWBDN-1 BUS-0041 CBL-0031 480. 16504.2/ -97.
 16504.1/ 143. 16504.2/ 23.

Mar 17, 2010 12:37:42
 PAGE 17
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0042 VOLTAGE BASE LL: 480.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 17159.9 / -103. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 2.060 +j 6.700 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 3.252

	ASYM 1/2 CYCLES	RMS 2 CYCLES	INTERRUPTING AMPS 3 CYCLES	5 CYCLES	8 CYCLES
17159.9	19487.9	17167.5	17160.1	17159.9	

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 17159.9 / -102.9 17159.9 / 137.1 17159.9 / 17.1

BUS-0042
 =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 B-SWBDN-1 480.0 0.1606 / -65. 0.1606 / 175. 0.1606 / 55.
 BUS-0042 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 BRANCH NAME VBASE LL -PHASE A- -
 PHASE B- -PHASE C-
 B-SWBDN-1 BUS-0042 CBL-0032 480. 17159.9/-103.
 17159.9/ 137. 17159.9/ 17.

Mar 17, 2010 12:37:42
 PAGE 18
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0043 VOLTAGE BASE LL: 480.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 4947.5 / -66. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 19.658 +j 14.303 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 0.728

	ASYM 1/2 CYCLES	RMS 2 CYCLES	INTERRUPTING AMPS 3 CYCLES	5 CYCLES	8
CYCLES	4948.4	4947.5	4947.5	4947.5	
4947.5					

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 4947.5 / -66.0 4947.5 / 174.0 4947.5 / 54.0

BUS-0043 =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 B-SWBDN-1 480.0 0.8395 / -42. 0.8395 / -162. 0.8395 / 78.
 BUS-0043 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====

	FIRST BUS FROM FAULT	AT TIME =
0.5 CYCLES		
PHASE B- -PHASE C-	BRANCH NAME	VBASE LL -PHASE A- -
ELEV BUS-0043		480. 141.9/-114.
141.9/ 126. 141.9/ 6.		
B-SWBDN-1 BUS-0043	CBL-0033	480. 4854.2/ -65.
4854.2/ 175. 4854.2/ 55.		

Mar 17, 2010 12:37:42
 PAGE 19
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0044 VOLTAGE BASE LL: 480.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 10293.9 / -79. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 7.654 +j 8.829 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 1.153
 ASYM RMS INTERRUPTING AMPS
 1/2 CYCLES 2 CYCLES 3 CYCLES 5 CYCLES 8
 CYCLES
 10293.9 10338.2 10293.9 10293.9 10293.9

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 10293.9 / -79.1 10293.9 / 160.9 10293.9 / 40.9

BUS-0044 =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 B-SWBDN-1 480.0 0.6106 / -56. 0.6106 / -176. 0.6106 / 64.
 BUS-0044 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====

FIRST BUS FROM FAULT AT TIME =
 0.5 CYCLES
 BRANCH NAME VBASE LL -PHASE A- -
 PHASE B- -PHASE C-
 AHU-1 BUS-0044 480. 177.3/-114.
 177.3/ 126. 177.3/ 6.
 B-SWBDN-1 BUS-0044 CBL-0034 480. 10149.6/ -78.
 10149.6/ 162. 10149.6/ 42.

Mar 17, 2010 12:37:42
 PAGE 20
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0045 VOLTAGE BASE LL: 480.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 6336.6 / -64. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 15.750 +j 10.594 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 0.673

	ASYM 1/2 CYCLES	RMS 2 CYCLES	INTERRUPTING AMPS 3 CYCLES	5 CYCLES	8
CYCLES	6337.2	6336.6	6336.6	6336.6	
6336.6					

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 6336.6 / -63.9 6336.6 / 176.1 6336.6 / 56.1

BUS-0045 =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 B-SWBDN-1 480.0 0.8125 / -47. 0.8125 / -167. 0.8125 / 73.
 BUS-0045 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====

	FIRST BUS FROM FAULT	AT TIME =
0.5 CYCLES		
PHASE B- -PHASE C-	BRANCH NAME	VBASE LL -PHASE A- -
AHU-2 BUS-0045		480. 177.3/-114.
177.3/ 126. 177.3/ 6.		
B-SWBDN-1 BUS-0045	CBL-0035	480. 6225.0/ -63.
6225.0/ 177. 6225.0/ 57.		

Mar 17, 2010 12:37:42
 PAGE 21
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0046 VOLTAGE BASE LL: 480.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 8876.3 / -76. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 9.400 +j 9.760 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 1.038

	ASYM 1/2 CYCLES	RMS 2 CYCLES	INTERRUPTING AMPS 3 CYCLES	5 CYCLES	8
CYCLES	8897.1	8876.3	8876.3	8876.3	
8876.3					

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 8876.3 / -76.1 8876.2 / 163.9 8876.3 / 43.9

BUS-0046 =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 B-SWBDN-1 480.0 0.6803 / -52. 0.6803 / -172. 0.6803 / 68.
 BUS-0046 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====

	FIRST BUS FROM FAULT	AT TIME =
0.5 CYCLES		
PHASE B- -PHASE C-	BRANCH NAME	VBASE LL -PHASE A- -
ERU-1 BUS-0046		480. 368.8/-114.
368.8/ 126. 368.8/ 6.		
B-SWBDN-1 BUS-0046	CBL-0036	480. 8589.5/ -75.
8589.5/ 165. 8589.5/ 45.		

Mar 17, 2010 12:37:42
 PAGE 22
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0047 VOLTAGE BASE LL: 480.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 16558.0 / -101. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 2.392 +j 6.859 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 2.868
 ASYM RMS INTERRUPTING AMPS
 1/2 CYCLES 2 CYCLES 3 CYCLES 5 CYCLES 8
 CYCLES
 18316.4 16560.6 16558.0 16558.0
 16558.0

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 16558.0 / -100.8 16558.0 / 139.2 16558.0 / 19.2

BUS-0047 ==== INI. SYM. RMS SYSTEM BUS VOLTAGES (PU / DEG)
 =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 B-SWBDN-1 480.0 0.2251 / -67. 0.2251 / 173. 0.2251 / 53.
 BUS-0047 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====

FIRST BUS FROM FAULT AT TIME =
 0.5 CYCLES
 BRANCH NAME VBASE LL -PHASE A- -
 PHASE B- -PHASE C-
 CH-1 BUS-0047 480. 1639.1/-114.
 1639.1/ 126. 1639.1/ 6.
 B-SWBDN-1 BUS-0047 CBL-0037 480. 14969.2/ -99.
 14969.2/ 141. 14969.2/ 21.

Mar 17, 2010 12:37:42
 PAGE 23
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0049 VOLTAGE BASE LL: 480.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 4837.8 / -65. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 20.449 +j 14.142 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 0.692

	ASYM 1/2 CYCLES	RMS 2 CYCLES	INTERRUPTING AMPS 3 CYCLES	5 CYCLES	8 CYCLES
4837.8	4838.3	4837.8	4837.8	4837.8	

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 4837.8 / -64.7 4837.8 / 175.3 4837.8 / 55.3

BUS-0049 =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 BUS-0048 480.0 0.2862 / -42. 0.2862 / -162. 0.2862 / 78.
 BUS-0049 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 BRANCH NAME VBASE LL -PHASE A- -
 PHASE B- -PHASE C-
 BUS-0048 BUS-0049 CBL-0039 480. 4837.8/ -65.
 4837.8/ 175. 4837.8/ 55.

Mar 17, 2010 12:37:42
 PAGE 24
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0051 VOLTAGE BASE LL: 480.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 19008.7 / -107. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 1.416 +j 6.167 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 4.356
 ASYM RMS INTERRUPTING AMPS
 1/2 CYCLES 2 CYCLES 3 CYCLES 5 CYCLES 8
 CYCLES
 23068.4 19067.9 19012.0 19008.7
 19008.7

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 19008.7 / -107.1 19008.7 / 132.9 19008.7 / 12.9

BUS-0051 =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 B-SWBDN-1 480.0 0.0460 / -74. 0.0460 / 166. 0.0460 / 46.
 BUS-0052 208.0 0.0000 / 0. 0.0000 / 0. 0.0000 / 0.
 BUS-0051 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====

FIRST BUS FROM FAULT AT TIME =
 0.5 CYCLES
 BRANCH NAME VBASE LL -PHASE A- -
 PHASE B- -PHASE C-
 B-SWBDN-1 BUS-0051 CBL-0041 480. 19008.7/-107.
 19008.7/ 133. 19008.7/ 13.
 BUS-0051 BUS-0052 B-T-1 480. 85.5/ 132.
 85.5/ 12. 85.5/-108.

Mar 17, 2010 12:37:42
 PAGE 25
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0052 VOLTAGE BASE LL: 208.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 43866.1 / -137. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 1.416 +j 6.167 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 4.356
 ASYM RMS INTERRUPTING AMPS
 1/2 CYCLES 2 CYCLES 3 CYCLES 5 CYCLES 8
 CYCLES
 53234.4 44002.8 43873.7 43866.1
 43866.1

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 43866.1 / -137.1 43866.1 / 102.9 43866.1 / -17.1

BUS-0052 =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 BUS-0051 480.0 0.0000 / -62. 0.0000 / 178. 0.0000 / 58.
 BUS-BPNL1 208.0 0.0000 / 0. 0.0000 / 0. 0.0000 / 0.
 BUS-0052 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====

FIRST BUS FROM FAULT AT TIME =
 0.5 CYCLES
 BRANCH NAME VBASE LL -PHASE A- -
 PHASE B- -PHASE C-
 BUS-0051 BUS-0052 B-T-1 480. 18964.6/-107.
 18964.6/ 133. 18964.6/ 13.
 BUS-0052 BUS-BPNL1 CBL-0042 208. 0.0/ 0.
 0.0/ 0. 0.0/ 0.

Mar 17, 2010 12:37:42
 PAGE 26
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0054 VOLTAGE BASE LL: 480.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 18377.5 / -104. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 1.765 +j 6.303 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 3.571
 ASYM RMS INTERRUPTING AMPS
 1/2 CYCLES 2 CYCLES 3 CYCLES 5 CYCLES 8
 CYCLES
 21306.7 18393.6 18377.9 18377.5
 18377.5

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 18377.5 / -104.4 18377.4 / 135.6 18377.5 / 15.6

BUS-0054 =====
 ===== INI. SYM. RMS SYSTEM BUS VOLTAGES (PU / DEG)
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 B-SWBDN-1 480.0 0.1012 / -78. 0.1012 / 162. 0.1012 / 42.
 BUS-0055 208.0 0.0000 / 0. 0.0000 / 0. 0.0000 / 0.
 BUS-0054 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====

FIRST BUS FROM FAULT AT TIME =
 0.5 CYCLES
 BRANCH NAME VBASE LL -PHASE A- -
 PHASE B- -PHASE C-
 B-SWBDN-1 BUS-0054 CBL-0060 480. 18377.5/-104.
 18377.4/ 136. 18377.5/ 16.
 BUS-0054 BUS-0055 B-T-4 480. 85.5/ 132.
 85.5/ 12. 85.5/-108.

Mar 17, 2010 12:37:42
 PAGE 27
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0055 VOLTAGE BASE LL: 208.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 42409.4 / -134. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 1.765 +j 6.303 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 3.571
 ASYM RMS INTERRUPTING AMPS
 1/2 CYCLES 2 CYCLES 3 CYCLES 5 CYCLES 8
 CYCLES
 49169.1 42446.6 42410.5 42409.4
 42409.4

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 42409.4 / -134.4 42409.4 / 105.6 42409.4 / -14.4

BUS-0055 =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 BUS-0054 480.0 0.0000 / -59. 0.0000 / -179. 0.0000 / 61.
 BUS-0062 208.0 0.0000 / 0. 0.0000 / 0. 0.0000 / 0.
 BUS-0055 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====

FIRST BUS FROM FAULT AT TIME =
 0.5 CYCLES
 BRANCH NAME VBASE LL -PHASE A- -
 PHASE B- -PHASE C-
 BUS-0054 BUS-0055 B-T-4 480. 18329.9/-105.
 18329.9/ 135. 18329.9/ 15.
 BUS-0055 BUS-0062 CBL-0044 208. 0.0/ 0.
 0.0/ 0. 0.0/ 0.

Mar 17, 2010 12:37:42
 PAGE 28
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0057 VOLTAGE BASE LL: 208.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 37425.9 / -132. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 2.279 +j 7.058 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 3.096
 ASYM RMS INTERRUPTING AMPS
 1/2 CYCLES 2 CYCLES 3 CYCLES 5 CYCLES 8
 CYCLES
 37425.9 42058.6 37437.1 37426.1 37425.9

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 37425.9 / -132.1 37425.9 / 107.9 37425.9 / -12.1

BUS-0057 =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 BUS-BPNL1 208.0 0.1010 / -94. 0.1010 / 146. 0.1010 / 26.
 BUS-0057 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====
 FIRST BUS FROM FAULT AT TIME =
 0.5 CYCLES
 BRANCH NAME VBASE LL -PHASE A- -
 PHASE B- -PHASE C-
 BUS-BPNL1 BUS-0057 CBL-0045 208. 37425.9/-132.
 37425.9/ 108. 37425.9/ -12.

Mar 17, 2010 12:37:42
 PAGE 29
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0058 VOLTAGE BASE LL: 208.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 34494.9 / -129. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 2.871 +j 7.517 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 2.618

	ASYM 1/2 CYCLES	RMS 2 CYCLES	INTERRUPTING AMPS 3 CYCLES	5 CYCLES	8 CYCLES
34494.9	37494.7	34497.3	34494.9	34494.9	

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 34494.9 / -129.1 34494.9 / 110.9 34494.9 / -9.1

BUS-0058 =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 BUS-BPNL1 208.0 0.1862 / -91. 0.1862 / 149. 0.1862 / 29.
 BUS-0058 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 BRANCH NAME VBASE LL -PHASE A- -
 PHASE B- -PHASE C-
 BUS-BPNL1 BUS-0058 CBL-0046 208. 34494.9/-129.
 34494.9/ 111. 34494.9/ -9.

Mar 17, 2010 12:37:42
 PAGE 30
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0059 VOLTAGE BASE LL: 208.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 5729.0 / -103. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 35.563 +j 32.905 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 0.925

	ASYM 1/2 CYCLES	RMS 2 CYCLES	INTERRUPTING AMPS 3 CYCLES	5 CYCLES	8
CYCLES	5735.4	5729.0	5729.0	5729.0	
5729.0					

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 5729.0 / -102.8 5729.0 / 137.2 5729.0 / 17.2

BUS-0059 =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 BUS-BPNL1 208.0 0.8852 / -65. 0.8852 / 175. 0.8852 / 55.
 BUS-0059 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====
 FIRST BUS FROM FAULT AT TIME =
 0.5 CYCLES
 BRANCH NAME VBASE LL -PHASE A- -
 PHASE B- -PHASE C-
 BUS-BPNL1 BUS-0059 CBL-0047 208. 5729.0/-103.
 5729.0/ 137. 5729.0/ 17.

Mar 17, 2010 12:37:42
 PAGE 31
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0060 VOLTAGE BASE LL: 208.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 5729.0 / -103. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 35.563 +j 32.905 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 0.925

	ASYM 1/2 CYCLES	RMS 2 CYCLES	INTERRUPTING AMPS 3 CYCLES	5 CYCLES	8
CYCLES	5735.4	5729.0	5729.0	5729.0	
5729.0					

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 5729.0 / -102.8 5729.0 / 137.2 5729.0 / 17.2

BUS-0060 =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 BUS-BPNL1 208.0 0.8852 / -65. 0.8852 / 175. 0.8852 / 55.
 BUS-0060 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====
 FIRST BUS FROM FAULT AT TIME =
 0.5 CYCLES
 BRANCH NAME VBASE LL -PHASE A- -
 PHASE B- -PHASE C-
 BUS-BPNL1 BUS-0060 CBL-0048 208. 5729.0/-103.
 5729.0/ 137. 5729.0/ 17.

Mar 17, 2010 12:37:42
 PAGE 32
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0061 VOLTAGE BASE LL: 208.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 4277.8 / -102. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 48.581 +j 43.014 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 0.885

	ASYM 1/2 CYCLES	RMS 2 CYCLES	INTERRUPTING AMPS 3 CYCLES	5 CYCLES	8 CYCLES
4277.8	4281.3	4277.8	4277.8	4277.8	

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 4277.8 / -101.5 4277.8 / 138.5 4277.8 / 18.5

BUS-0061
 =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 BUS-BPNL1 208.0 0.9150 / -64. 0.9150 / 176. 0.9150 / 56.
 BUS-0061 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 BRANCH NAME VBASE LL -PHASE A- -
 PHASE B- -PHASE C-
 BUS-BPNL1 BUS-0061 CBL-0049 208. 4277.8/-102.
 4277.8/ 138. 4277.8/ 18.

Mar 17, 2010 12:37:42
 PAGE 33
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0063 VOLTAGE BASE LL: 208.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 34443.2 / -124. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 3.473 +j 7.272 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 2.094

	ASYM 1/2 CYCLES	RMS 2 CYCLES	INTERRUPTING AMPS 3 CYCLES	5 CYCLES	8 CYCLES
34443.2	36115.8	34443.5	34443.2	34443.2	

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 34443.2 / -124.5 34443.2 / 115.5 34443.2 / -4.5

BUS-0063
 =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 BUS-0062 208.0 0.0797 / -102. 0.0797 / 138. 0.0797 / 18.
 BUS-0063 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 BRANCH NAME VBASE LL -PHASE A- -
 PHASE B- -PHASE C-
 BUS-0062 BUS-0063 CBL-0054 208. 34443.2 / -124.
 34443.2 / 116. 34443.2 / -4.

Mar 17, 2010 12:37:42
 PAGE 34
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0064 VOLTAGE BASE LL: 208.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 2586.7 / -86. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 96.669 +j 46.589 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 0.482

	ASYM 1/2 CYCLES	RMS 2 CYCLES	INTERRUPTING AMPS 3 CYCLES	5 CYCLES	8
CYCLES	2586.7	2586.7	2586.7	2586.7	
2586.7					

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 2586.7 / -85.7 2586.7 / 154.3 2586.7 / 34.3

BUS-0064 =====
 INI. SYM. RMS SYSTEM BUS VOLTAGES (PU / DEG)

	FIRST BUS FROM FAULT ---PHASE A---	AT TIME = 0.5 CYCLES ---PHASE B---	---PHASE C---
C---			
BUS-0062	208.0 0.9486 / -63.	0.9486 / 177.	0.9486 / 57.
BUS-0064	===== INI.	RMS	SYSTEM BRANCH FLOWS (AMPS)

	FIRST BUS FROM FAULT	AT TIME =
0.5 CYCLES		
PHASE B- -PHASE C-	BRANCH NAME	VBASE LL -PHASE A- -
BUS-0062 BUS-0064	CBL-0055	208. 2586.7/ -86.
2586.7/ 154. 2586.7/ 34.		

Mar 17, 2010 12:37:42
 PAGE 35
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0065 VOLTAGE BASE LL: 208.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 27415.6 / -115. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 5.840 +j 8.270 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 1.416
 ASYM RMS INTERRUPTING AMPS
 1/2 CYCLES 2 CYCLES 3 CYCLES 5 CYCLES 8
 CYCLES
 27738.1 27415.6 27415.6 27415.6
 27415.6

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 27415.6 / -114.8 27415.6 / 125.2 27415.6 / 5.2

BUS-0065 =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 BUS-0062 208.0 0.3172 / -92. 0.3172 / 148. 0.3172 / 28.
 BUS-0065 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====
 FIRST BUS FROM FAULT AT TIME =
 0.5 CYCLES
 BRANCH NAME VBASE LL -PHASE A- -
 PHASE B- -PHASE C-
 BUS-0062 BUS-0065 CBL-0056 208. 27415.6/-115.
 27415.6/ 125. 27415.6/ 5.

Mar 17, 2010 12:37:42
 PAGE 36
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0070 VOLTAGE BASE LL: 208.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 1832.7 / -90. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 131.171 +j 75.719 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 0.577

	ASYM 1/2 CYCLES	RMS 2 CYCLES	INTERRUPTING AMPS 3 CYCLES	5 CYCLES	8
CYCLES	1832.7	1832.7	1832.7	1832.7	

1832.7

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 1832.7 / -90.0 1832.7 / 150.0 1832.7 / 30.0

BUS-0070 =====
 ===== INI. SYM. RMS SYSTEM BUS VOLTAGES (PU / DEG)
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 BUS-SFL 208.0 0.0026 / -70. 0.0026 / 170. 0.0026 / 50.
 BUS-1LEL1 208.0 0.0000 / 0. 0.0000 / 0. 0.0000 / 0.
 BUS-0070 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====

	FIRST BUS FROM FAULT	AT TIME =
0.5 CYCLES		
PHASE B- -PHASE C-	BRANCH NAME	VBASE LL -PHASE A- -
BUS-SFL BUS-0070	CBL-SFL	208. 1832.7/ -90.
1832.7/ 150. 1832.7/ 30.		
BUS-0070 BUS-1LEL1	CBL-0007	208. 0.0/ 0.
0.0/ 0. 0.0/ 0.		

Mar 17, 2010 12:37:42
 PAGE 37
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-0071 VOLTAGE BASE LL: 480.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 12947.0 / -76. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 6.484 +j 6.654 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 1.026
 ASYM RMS INTERRUPTING AMPS
 1/2 CYCLES 2 CYCLES 3 CYCLES 5 CYCLES 8
 CYCLES
 12975.3 12947.0 12947.0 12947.0
 12947.0

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 12947.0 / -75.7 12947.0 / 164.3 12947.0 / 44.3

BUS-0071 =====
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 BUS-B-ATS0-1-L 480.0 0.2395 / -70. 0.2395 / 170. 0.2395 / 50.
 BUS-0030 480.0 0.0000 / 0. 0.0000 / 0. 0.0000 / 0.
 BUS-0071 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====

FIRST BUS FROM FAULT AT TIME =
 0.5 CYCLES
 BRANCH NAME VBASE LL -PHASE A- -
 PHASE B- -PHASE C-
 BUS-B-ATS0-1-L BUS-0071 CBL-0008 480. 12947.0/ -76.
 12947.0/ 164. 12947.0/ 44.
 BUS-0071 BUS-0030 CBL-0017 480. 0.0/ 0.
 0.0/ 0. 0.0/ 0.

Mar 17, 2010 12:37:42
 PAGE 38
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-1LEL1 VOLTAGE BASE LL: 208.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 1305.2 / -86. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 190.343 +j 94.857 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 0.498

	ASYM 1/2 CYCLES	RMS 2 CYCLES	INTERRUPTING AMPS 3 CYCLES	5 CYCLES	8
CYCLES	1305.2	1305.2	1305.2	1305.2	
1305.2					

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 1305.2 / -86.5 1305.2 / 153.5 1305.2 / 33.5

BUS-1LEL1
 =====
 INI. SYM. RMS SYSTEM BUS VOLTAGES (PU / DEG)

	FIRST BUS FROM FAULT ---PHASE A---	AT TIME = 0.5 CYCLES ---PHASE B---	---PHASE C---
C---			
BUS-0070	208.0 0.2924 / -69.	0.2924 / 171.	0.2924 / 51.
BUS-1LEL1	===== INI.	RMS	SYSTEM BRANCH FLOWS (AMPS)

	FIRST BUS FROM FAULT	AT TIME =
0.5 CYCLES		
PHASE B- -PHASE C-	BRANCH NAME	VBASE LL -PHASE A- -
BUS-0070 BUS-1LEL1	CBL-0007	208. 1305.2/ -86.
1305.2/ 154. 1305.2/ 34.		

Mar 17, 2010 12:37:42
 PAGE 39
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-B-ATS0-1-L VOLTAGE BASE LL: 480.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 15590.0 / -86. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 4.270 +j 6.426 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 1.505

	ASYM 1/2 CYCLES	RMS 2 CYCLES	INTERRUPTING AMPS 3 CYCLES	5 CYCLES	8
CYCLES	15827.8	15590.0	15590.0	15590.0	
15590.0					

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 15590.0 / -86.4 15590.0 / 153.6 15590.0 / 33.6

BUS-B-ATS0-1-L ==== INI. SYM. RMS SYSTEM BUS VOLTAGES (PU / DEG)
 =====

	FIRST BUS FROM FAULT ---PHASE A---	AT TIME = ---PHASE B---	0.5 CYCLES ---PHASE C---
C---			
BUS-0038	480.0 0.0000 / -41.	0.0000 / -161.	0.0000 / 79.
BUS-0071	480.0 0.0000 / 0.	0.0000 / 0.	0.0000 / 0.
BUS-B-ATS0-1-L	===== INI.	RMS	SYSTEM BRANCH FLOWS (AMPS)

	FIRST BUS FROM FAULT	AT TIME =
0.5 CYCLES		
PHASE B- -PHASE C-	BRANCH NAME	VBASE LL -PHASE A- -
BUS-0038 BUS-B-ATS0-1-L	B-ATSE-3	480. 15590.0/ -86.
15590.0/ 154. 15590.0/ 34.		
BUS-B-ATS0-1-L BUS-0071	CBL-0008	480. 0.0/ 0.
0.0/ 0. 0.0/ 0.		

Mar 17, 2010 12:37:42
 PAGE 40
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-B-ATSE-1-L VOLTAGE BASE LL: 480.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 19290.1 / -107. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 1.450 +j 6.064 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 4.183

	ASYM 1/2 CYCLES	RMS 2 CYCLES	INTERRUPTING AMPS 3 CYCLES	5 CYCLES	8 CYCLES
19290.2	23190.9	19337.5	19292.5	19290.2	

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 19290.1 / -106.6 19290.1 / 133.4 19290.1 / 13.4

BUS-B-ATSE-1-L ==== INI. SYM. RMS SYSTEM BUS VOLTAGES (PU / DEG)
 =====

	FIRST BUS FROM FAULT ---PHASE A---	AT TIME = ---PHASE B---	0.5 CYCLES ---PHASE C---
C---			
BUS-B-T-2-PRIM	480.0 0.0000 / 0.	0.0000 / 0.	0.0000 / 0.
BUS-0040	480.0 0.0000 / -61.	0.0000 / 179.	0.0000 / 59.
BUS-B-ATSE-1-L	===== INI.	RMS	SYSTEM BRANCH FLOWS (AMPS)

	FIRST BUS FROM FAULT	AT TIME =
0.5 CYCLES		
PHASE B- -PHASE C-	BRANCH NAME	VBASE LL -PHASE A- -
BUS-B-ATSE-1-L BUS-B-T-2-PRIM	CBL-0005	480. 0.0/ 0.
0.0/ 0. 0.0/ 0.		
BUS-0040 BUS-B-ATSE-1-L B-ATSE-1		480. 19290.2/-107.
19290.1/ 133. 19290.1/ 13.		

Mar 17, 2010 12:37:42
 PAGE 41
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-B-ATSE-2-L VOLTAGE BASE LL: 480.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 16499.3 / -92. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 3.400 +j 6.449 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 1.896

	ASYM 1/2 CYCLES	RMS 2 CYCLES	INTERRUPTING AMPS 3 CYCLES	5 CYCLES	8
CYCLES	17089.3	16499.3	16499.3	16499.3	
16499.3					

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 16499.3 / -92.2 16499.3 / 147.8 16499.3 / 27.8

BUS-B-ATSE-2-L ==== INI. SYM. RMS SYSTEM BUS VOLTAGES (PU / DEG)
 =====

	FIRST BUS FROM FAULT ---PHASE A---	AT TIME = ---PHASE B---	0.5 CYCLES ---PHASE C---
C---			
BUS-B-T-5-PRIM	480.0 0.0000 / 0.	0.0000 / 0.	0.0000 / 0.
BUS-0039	480.0 0.0000 / -47.	0.0000 / -167.	0.0000 / 73.
BUS-B-ATSE-2-L	===== INI.	RMS	SYSTEM BRANCH FLOWS (AMPS)

	FIRST BUS FROM FAULT	AT TIME =
0.5 CYCLES		
BRANCH NAME	VBASE LL	-PHASE A- -
PHASE B- -PHASE C-		
BUS-B-ATSE-2-L BUS-B-T-5-PRIM CBL-0006	480.	0.0/ 0.
0.0/ 0. 0.0/ 0.		
BUS-0039 BUS-B-ATSE-2-L B-ATSE-2	480.	16499.3/ -92.
16499.3/ 148. 16499.3/ 28.		

Mar 17, 2010 12:37:42
 PAGE 42
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-B-T-2-PRIM VOLTAGE BASE LL: 480.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 17313.7 / -96. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 2.843 +j 6.339 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 2.230

	ASYM 1/2 CYCLES	RMS 2 CYCLES	INTERRUPTING AMPS 3 CYCLES	5 CYCLES	8 CYCLES
17313.7	18318.5	17313.9	17313.7	17313.7	

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 17313.7 / -95.8 17313.7 / 144.2 17313.7 / 24.2

BUS-B-T-2-PRIM ==== INI. SYM. RMS SYSTEM BUS VOLTAGES (PU / DEG)
 =====

	FIRST BUS FROM FAULT ---PHASE A---	AT TIME = 0.5 CYCLES ---PHASE B---	---PHASE C---
C---			
BUS-B-ATSE-1-L	480.0 0.2044 / -85.	0.2044 / 155.	0.2044 / 35.
BUS-B-T-2-SEC	208.0 0.0000 / 0.	0.0000 / 0.	0.0000 / 0.
BUS-B-T-2-PRIM	===== INI.	RMS	SYSTEM BRANCH FLOWS (AMPS)

	FIRST BUS FROM FAULT 0.5 CYCLES	AT TIME =
PHASE B- -PHASE C-	BRANCH NAME	VBASE LL -PHASE A- -
BUS-B-ATSE-1-L BUS-B-T-2-PRIM	CBL-0005	480. 17313.7/ -96.
17313.7/ 144. 17313.7/ 24.		
BUS-B-T-2-PRIM BUS-B-T-2-SEC	T-B-T-2	480. 0.0/ 0.
0.0/ 0. 0.0/ 0.		

Mar 17, 2010 12:37:42
 PAGE 43
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-B-T-2-PRIM VOLTAGE BASE LL: 480.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 795.7 / -90. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 131.389 +j 74.756 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 0.569

	ASYM 1/2 CYCLES	RMS 2 CYCLES	INTERRUPTING AMPS 3 CYCLES	5 CYCLES	8
CYCLES	795.7	795.7	795.7	795.7	

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 795.7 / -89.6 795.7 / 150.4 795.7 / 30.4

BUS-B-T-2-PRIM ==== INI. SYM. RMS SYSTEM BUS VOLTAGES (PU / DEG)
 =====

	FIRST BUS FROM FAULT ---PHASE A---	AT TIME = ---PHASE B---	0.5 CYCLES ---PHASE C---
C--- BUS-B-T-5-PRIM	480.0 0.9413 / -31.	0.9413 / -151.	0.9413 / 89.
BUS-SFL 2	480.0 0.0000 / 0.	0.0000 / 0.	0.0000 / 0.

BUS-B-T-2-PRIM ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====

	FIRST BUS FROM FAULT BRANCH NAME	AT TIME = VBASE LL	0.5 CYCLES -PHASE A-	-
PHASE B- -PHASE C-				
BUS-B-T-5-PRIM BUS-B-T-2-PRIM	T-B-T-5	480.	795.7/ -60.	
795.7/-180. 795.7/ 60.				
BUS-B-T-2-PRIM BUS-SFL 2	CBL-0010	480.	0.0/ 0.	
0.0/ 0. 0.0/ 0.				

Mar 17, 2010 12:37:42
 PAGE 44
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-B-T-2-SEC VOLTAGE BASE LL: 208.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 1876.9 / -90. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 127.843 +j 74.339 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 0.581

	ASYM 1/2 CYCLES	RMS 2 CYCLES	INTERRUPTING AMPS 3 CYCLES	5 CYCLES	8
CYCLES	1877.0	1876.9	1876.9	1876.9	
1876.9					

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 1876.9 / -90.2 1876.9 / 149.8 1876.9 / 29.8

BUS-B-T-2-SEC ==== INI. SYM. RMS SYSTEM BUS VOLTAGES (PU / DEG)
 =====

	FIRST BUS FROM FAULT ---PHASE A---	AT TIME = 0.5 CYCLES ---PHASE B---	---PHASE C---
C---			
BUS-B-T-2-PRIM	480.0 0.9622 / -32.	0.9622 / -152.	0.9622 / 88.
BUS-SFL	208.0 0.0000 / 0.	0.0000 / 0.	0.0000 / 0.
BUS-B-T-2-SEC	===== INI.	RMS	SYSTEM BRANCH FLOWS (AMPS)

	FIRST BUS FROM FAULT	AT TIME =
0.5 CYCLES		
PHASE B- -PHASE C-	BRANCH NAME	VBASE LL -PHASE A- -
BUS-B-T-2-PRIM BUS-B-T-2-SEC	T-B-T-2	480. 813.3/ -60.
813.3/ 180. 813.3/ 60.		
BUS-B-T-2-SEC BUS-SFL	CBL-006	208. 0.0/ 0.
0.0/ 0. 0.0/ 0.		

Mar 17, 2010 12:37:42
 PAGE 45
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-B-T-5-PRIM VOLTAGE BASE LL: 480.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 12935.7 / -77. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 6.389 +j 6.756 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 1.058

	ASYM 1/2 CYCLES	RMS 2 CYCLES	INTERRUPTING AMPS 3 CYCLES	5 CYCLES	8 CYCLES
12935.7	12969.7	12935.7	12935.7	12935.7	

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 12935.7 / -76.6 12935.7 / 163.4 12935.7 / 43.4

BUS-B-T-5-PRIM ==== INI. SYM. RMS SYSTEM BUS VOLTAGES (PU / DEG)
 =====

	FIRST BUS FROM FAULT ---PHASE A---	AT TIME = 0.5 CYCLES ---PHASE B---	---PHASE C---
C---			
BUS-B-ATSE-2-L	480.0 0.3231 / -71.	0.3231 / 169.	0.3231 / 49.
BUS-B-T-2-PRIM	480.0 0.0000 / 0.	0.0000 / 0.	0.0000 / 0.
BUS-B-T-5-PRIM	===== INI.	RMS	SYSTEM BRANCH FLOWS (AMPS)

	FIRST BUS FROM FAULT	AT TIME =
0.5 CYCLES		
PHASE B- -PHASE C-	BRANCH NAME	VBASE LL -PHASE A- -
BUS-B-ATSE-2-L BUS-B-T-5-PRIM	CBL-0006	480. 12935.7/ -77.
12935.7/ 163. 12935.7/ 43.		
BUS-B-T-5-PRIM BUS-B-T-2-PRIM	T-B-T-5	480. 0.0/ 0.
0.0/ 0. 0.0/ 0.		

Mar 17, 2010 12:37:42
 PAGE 46
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

BUS-BLEH1 VOLTAGE BASE LL: 480.0 (VOLTS)
 INI. SYM. RMS FAULT CURRENT: 790.7 / -90. (AMPS/DEG)
 THEVENIN EQUIVALENT IMPEDANCE: 132.353 +j 74.976 (PU)
 THEVENIN IMPEDANCE X/R RATIO: 0.566

	ASYM 1/2 CYCLES	RMS 2 CYCLES	INTERRUPTING AMPS 3 CYCLES	5 CYCLES	8
CYCLES	790.7	790.7	790.7	790.7	
790.7					

INI. SYM. RMS FAULTED BUS VOLTAGES (PU / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 0.0000 / 0.0 0.0000 / 0.0 0.0000 / 0.0

INI. RMS FAULTED CURRENT (AMPS / DEG)
 AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 790.7 / -89.5 790.7 / 150.5 790.7 / 30.5

BUS-BLEH1 =====
 ===== INI. SYM. RMS SYSTEM BUS VOLTAGES (PU / DEG)
 FIRST BUS FROM FAULT AT TIME = 0.5 CYCLES
 ---PHASE A--- ---PHASE B--- ---PHASE C---
 C---
 BUS-SFL 2 480.0 0.0006 / -73. 0.0006 / 167. 0.0006 / 47.
 BUS- 480.0 0.0000 / 0. 0.0000 / 0. 0.0000 / 0.
 BUS-BLEH1 ===== INI. RMS SYSTEM BRANCH FLOWS (AMPS) =====

		FIRST BUS FROM FAULT	AT TIME =		
			0.5 CYCLES		
		BRANCH NAME	VBASE LL	-PHASE A-	-
PHASE B-	-PHASE C-				
BUS-SFL 2	BUS-BLEH1	CBL-SFL0	480.	790.7/ -90.	
790.7/ 150.	790.7/ 30.				
BUS-BLEH1	BUS-	CBL-0011	480.	0.0/ 0.	
0.0/ 0.	0.0/ 0.				

Mar 17, 2010 12:37:42
 PAGE 47
 VIRGINIA TECH
 EMERGENCY SYSTEM POWER STUDY
 GENERATOR CONTRIBUTION

***** F A U L T A N A L Y S I S S U M M A R Y

BUS NAME	VOLTAGE L-L	AVAILABLE 3 PHASE	FAULT CURRENT X/R LINE/GRND	X/R
B-SWBDN-1	480.	19645.3	5.1	
BUS-	480.	710.2	0.5	
BUS-0030	480.	8866.7	0.6	
BUS-0031	208.	1397.3	0.8	
BUS-0033	208.	344.0	0.2	
BUS-0034	12000.	18186.8	8.0	
BUS-0036	480.	19812.5	5.2	
BUS-0038	480.	15590.0	1.5	
BUS-0039	480.	16499.3	1.9	
BUS-0040	480.	19290.2	4.2	
BUS-0041	480.	16504.2	2.4	
BUS-0042	480.	17159.9	3.3	
BUS-0043	480.	4947.5	0.7	
BUS-0044	480.	10293.9	1.2	
BUS-0045	480.	6336.6	0.7	
BUS-0046	480.	8876.3	1.0	
BUS-0047	480.	16558.0	2.9	
BUS-0049	480.	4837.8	0.7	
BUS-0051	480.	19008.7	4.4	
BUS-0052	208.	43866.1	4.4	
BUS-0054	480.	18377.5	3.6	
BUS-0055	208.	42409.4	3.6	
BUS-0057	208.	37425.9	3.1	
BUS-0058	208.	34494.9	2.6	
BUS-0059	208.	5729.0	0.9	
BUS-0060	208.	5729.0	0.9	
BUS-0061	208.	4277.8	0.9	
BUS-0063	208.	34443.2	2.1	
BUS-0064	208.	2586.7	0.5	
BUS-0065	208.	27415.6	1.4	
BUS-0070	208.	1832.7	0.6	
BUS-0071	480.	12947.0	1.0	
BUS-1LEL1	208.	1305.2	0.5	
BUS-B-ATS0-1-L	480.	15590.0	1.5	
BUS-B-ATSE-1-L	480.	19290.1	4.2	

BUS-B-ATSE-2-L	480.	16499.3	1.9
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Mar 17, 2010 12:37:42
PAGE 48
VIRGINIA TECH
EMERGENCY SYSTEM POWER STUDY
GENERATOR CONTRIBUTION

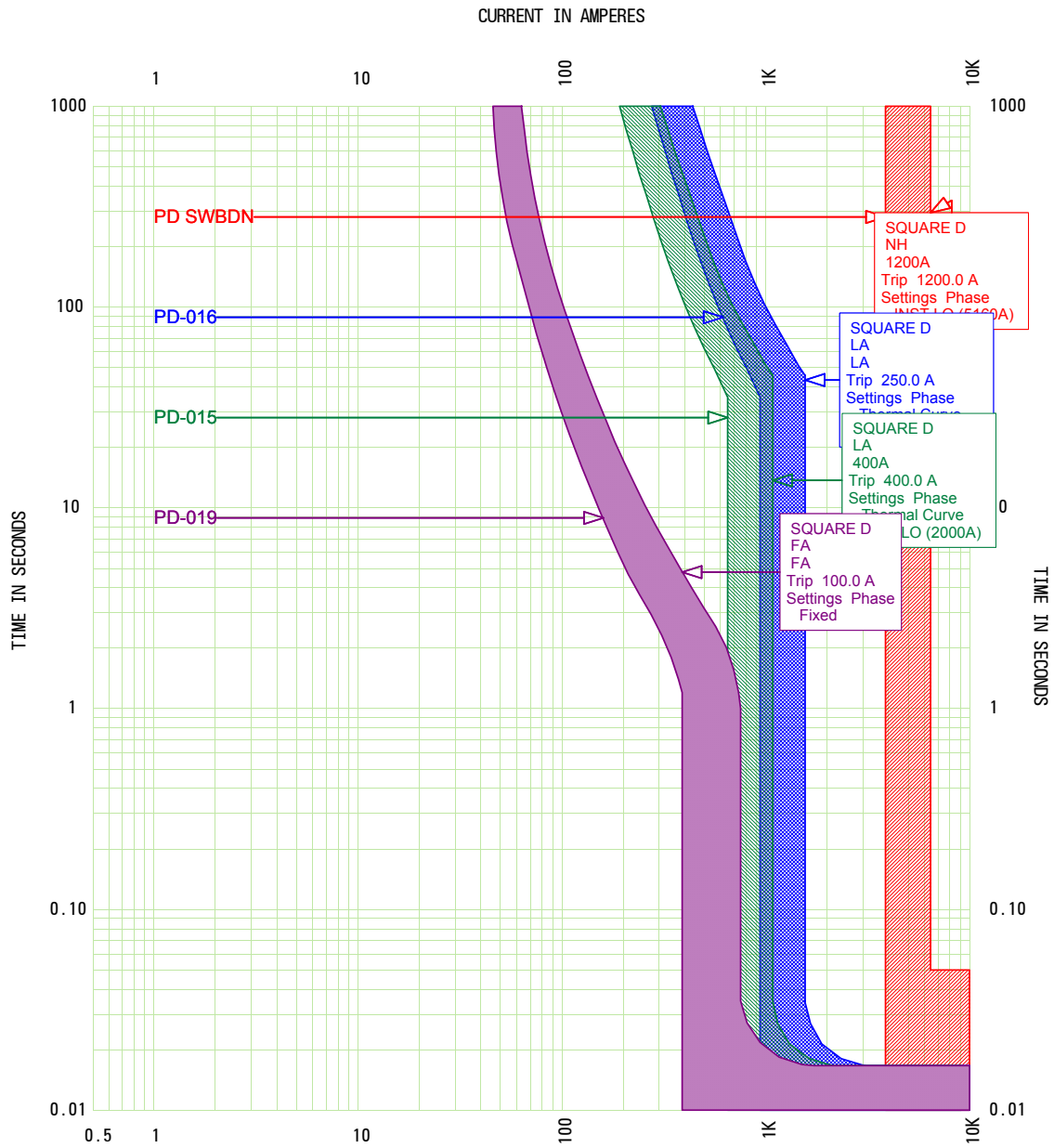
***** F A U L T A N A L Y S I S S U M M A R Y

BUS NAME	VOLTAGE	AVAILABLE	FAULT CURRENT	
	L-L	3 PHASE	X/R LINE/GRND	X/R
BUS-B-T-2-PRIM	480.	17313.7	2.2	
BUS-B-T-2-PRIM	480.	795.7	0.6	
BUS-B-T-2-SEC	208.	1876.9	0.6	
BUS-B-T-5-PRIM	480.	12935.7	1.1	
BUS-BLEH1	480.	790.7	0.6	

***** FAULT ANALYSIS REPORT COMPLETED

Bus Name	Protective Device Name	Bus KV	Bus Bolted Fault (kA)	Bus Arcing Fault (kA)	Prot Dev Bolted Fault (kA)	Prot Dev Arcing Fault (kA)	Tripping Time (sec)	Breaker Opening Time (sec)	Ground	Equip Type	Gap (mm)	Arc Flash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	Required Protective FR Clothing Category	Label #	Cable Length from Trip Device (ft)	Incident Energy at Marginal	Incident Energy at Marginal
34 BUS-1LEL1	PD-BLEL1-M CB	0.208	1.30	1.04	1.30	1.04	2	0.000	Yes	PNL	25	18	18	1.2	Category 0 (*N9)	# 0015	200.00		1.20
35																			
36 BUS-BATS0-1-L	PD-001	0.480	15.29	9.43	15.29	9.43	0.017	0.000	Yes	PNL	25	11	18	0.52	Category 0	# 0017	14.00		
37																			
38 BUS-BATSE-1-L	PD-003	0.480	18.82	11.25	18.82	11.25	0.016	0.000	Yes	PNL	25	12	18	0.61	Category 0	# 0018	2.00		
39																			
40 BUS-BATSE-2-L	PD-002	0.480	16.16	9.88	16.16	9.88	0.016	0.000	Yes	PNL	25	11	18	0.53	Category 0	# 0020	16.00		
41																			
42 BUS-B-T-2-PRIM1	PD-002	0.480	0.80	0.75	0.80	0.75	1.863	0.000	Yes	PNL	25	36	18	3.8	Category 1	# 0021	29.50		
43																			
44 BUS-B-T-2-PRIM	PD-003	0.480	16.93	10.28	16.93	10.28	0.016	0.000	Yes	PNL	25	11	18	0.55	Category 0	# 0022	12.00		
45																			
46 BUS-B-T-2-SEC	PD-003	0.208	1.88	1.34	1.88	1.34	2	0.000	Yes	PNL	25	18	18	1.2	Category 0 (*N9)	# 0023	12.00		1.20
47																			
48 BUS-B-T-5-PRIM	PD-002	0.480	12.74	8.07	12.74	8.07	0.016	0.000	Yes	PNL	25	10	18	0.43	Category 0	# 0024	29.50		
49																			
50 BUS-BLEH1	PD-BLEL1-M CB0	0.480	0.79	0.75	0.79	0.75	2	0.000	Yes	PNL	25	38	18	4.0	Category 2 (*N9)	# 0029		4.03	
51 BUS-BLEH1 (PD-BLEL1-MCB0 LineSide)	PD-002	0.480	0.79	0.75	0.79	0.75	1.876	0.000	Yes	PNL	25	36	18	3.8	Category 1	# 0025	39.50		
52																			
53 BUS-BPNL1 (PD-0039 LineSide)	PD-014	0.208	39.84	11.48	39.84	11.48	0.017	0.000	Yes	PNL	25	12	18	0.64	Category 0	# 0026	14.00		
Category 0: Nonmelting, Flammable Materials with Weight >= 4.5 oz/sq yd														#Cat 0 = 19	(*N1) - Out of IEEE 1584 Range. See Equation Used. Applicable for Open Air only. Existing Equipment type is not Open Air!				
Category 1: Arc-rated FR Shirt & Pants														#Cat 1 = 4	(*N2) < 80% Cleared Fault Threshold				
55														#Cat 2 = 1	(*N9) - Max Arcing Duration Reached				
56 Category 2: Arc-rated FR Shirt & Pants														#Cat 3 = 0	(*N15) - Report as category 0 if fed by one transformer size < 125 kVA				
57 Category 3: Arc-rated FR Shirt & Pants & Arc Flash Suit														#Cat 4 = 0					
58 Category 4: Arc-rated FR Shirt & Pants & Arc Flash Suit																			

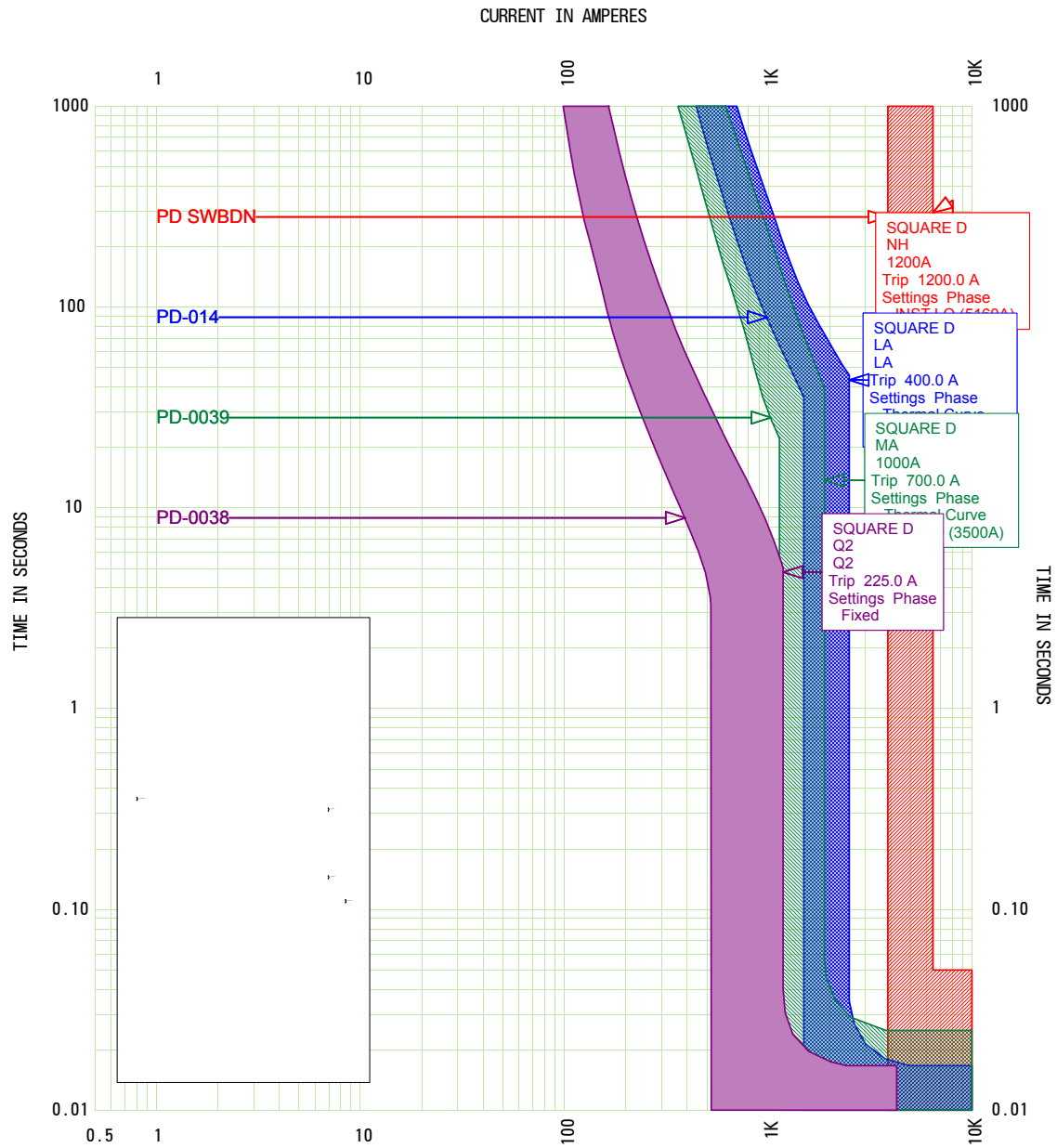
Bus Name	Protective Device Name	Bus KV	Bus Bolted Fault (kA)	Bus Arcing Fault (kA)	Prot Dev Bolted Fault (kA)	Prot Dev Arcing Fault (kA)	Tripping Time (sec.)	Breaker Opening Time (sec.)	Ground	Equip Type	Gap (mm)	Arc Flash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	Required Protective FR Clothing Category	Label #	Cable Length From Trip Device (ft)	Incident Energy at Marginal	Incident Energy at Marginal
Category Dangerous! No FR Category Found	Device with 80% Cleared Fault Threshold													#Danger = 2	IEEE 1584 - 2002/2004a Edition Bus + Line Side Report (Include Line Side + Load Side Contributions), 80% Cleared Fault Threshold, include Ind. Motors >= 50.0hp for 5.0 Cycles), mis-coordination not c				
59																			



TCC Name: 2LNL2
Online:
March 17, 2010 12:55 PM

Current Scale x 1

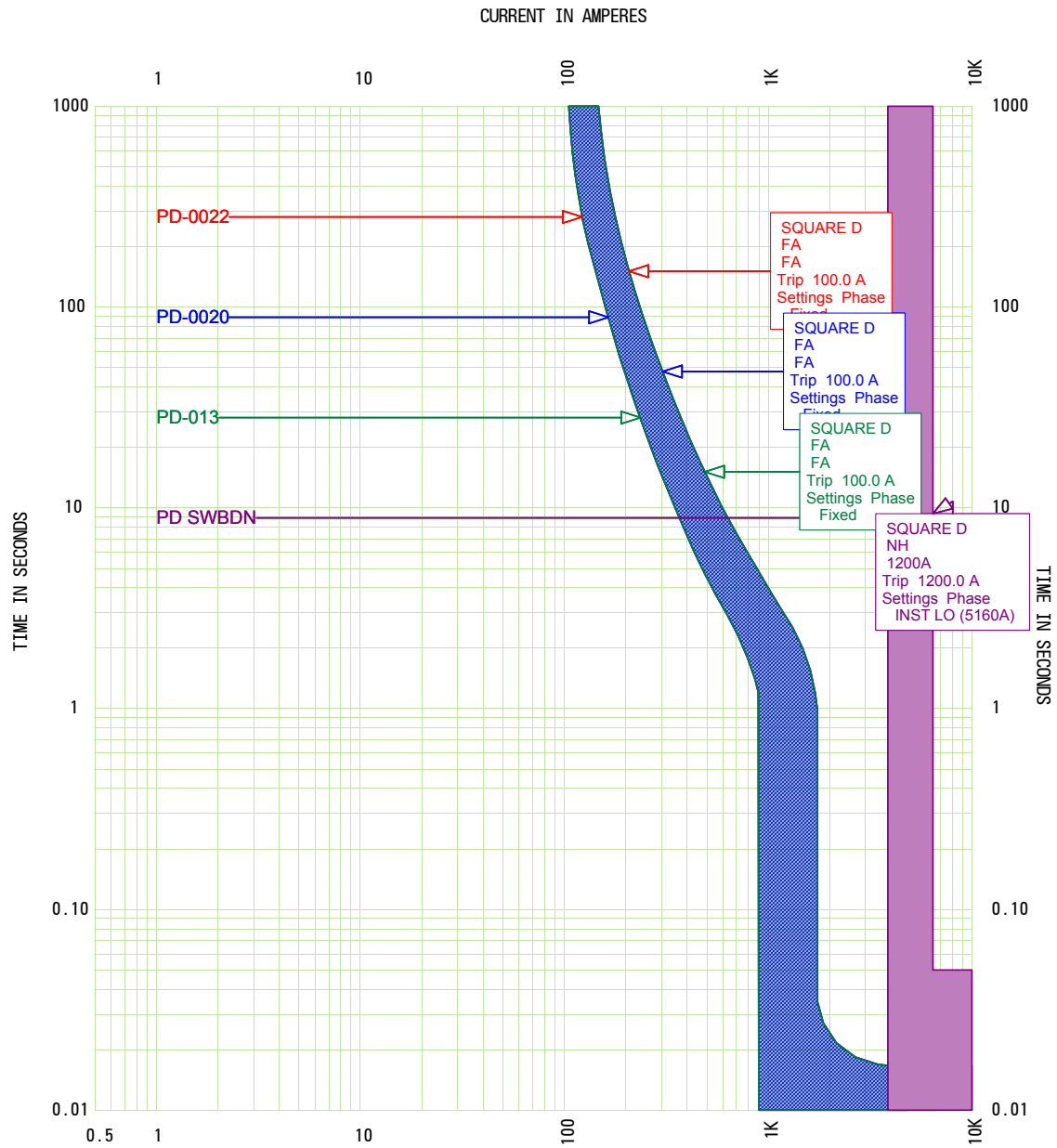
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SKM Systems Analysis, Inc.



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March 17, 2010 12:55 PM

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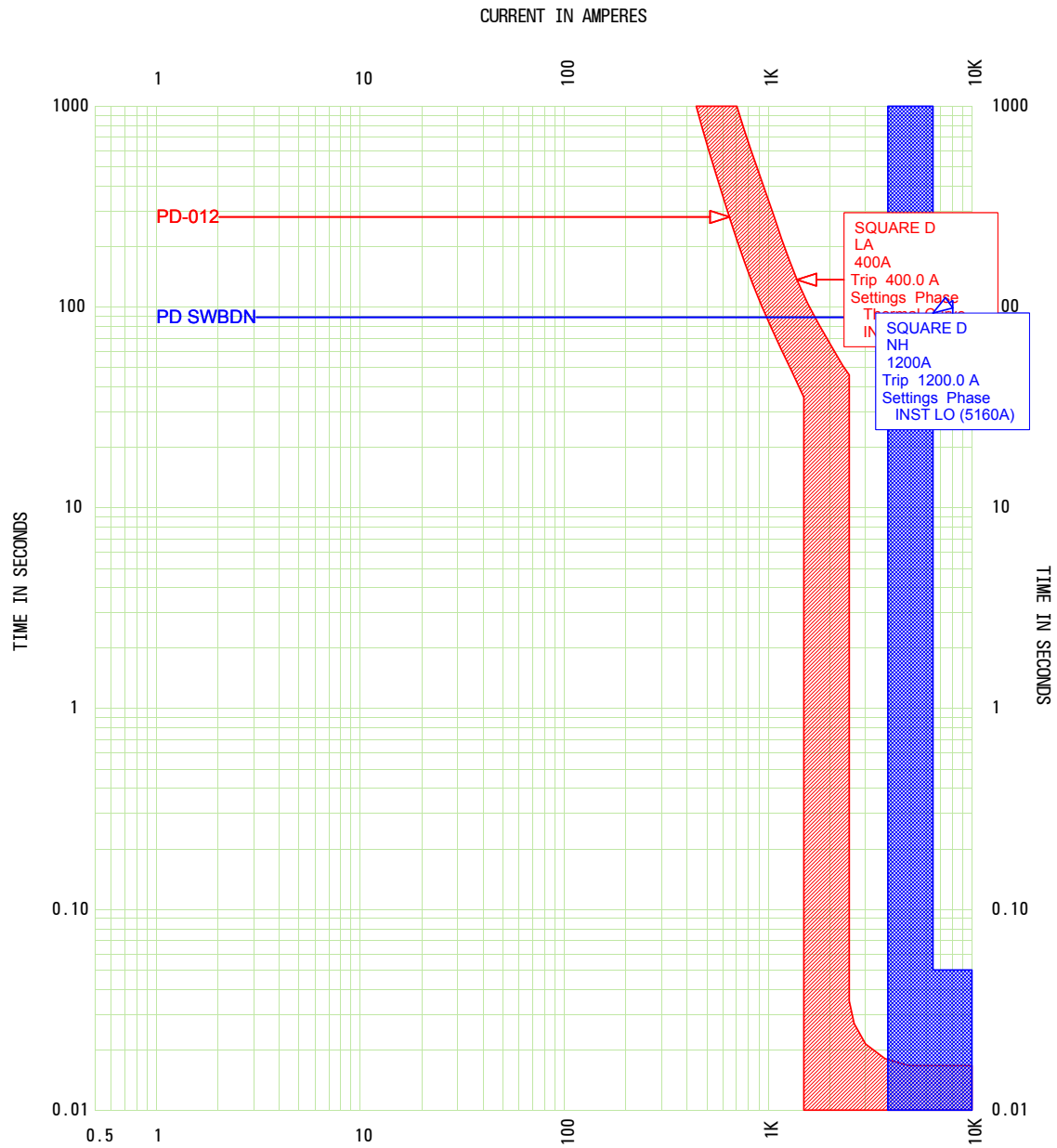
Reference Voltage: 480
SKM Systems Analysis, Inc.



TCC Name: 2LNH1
Online:
March 17, 2010 12:55 PM

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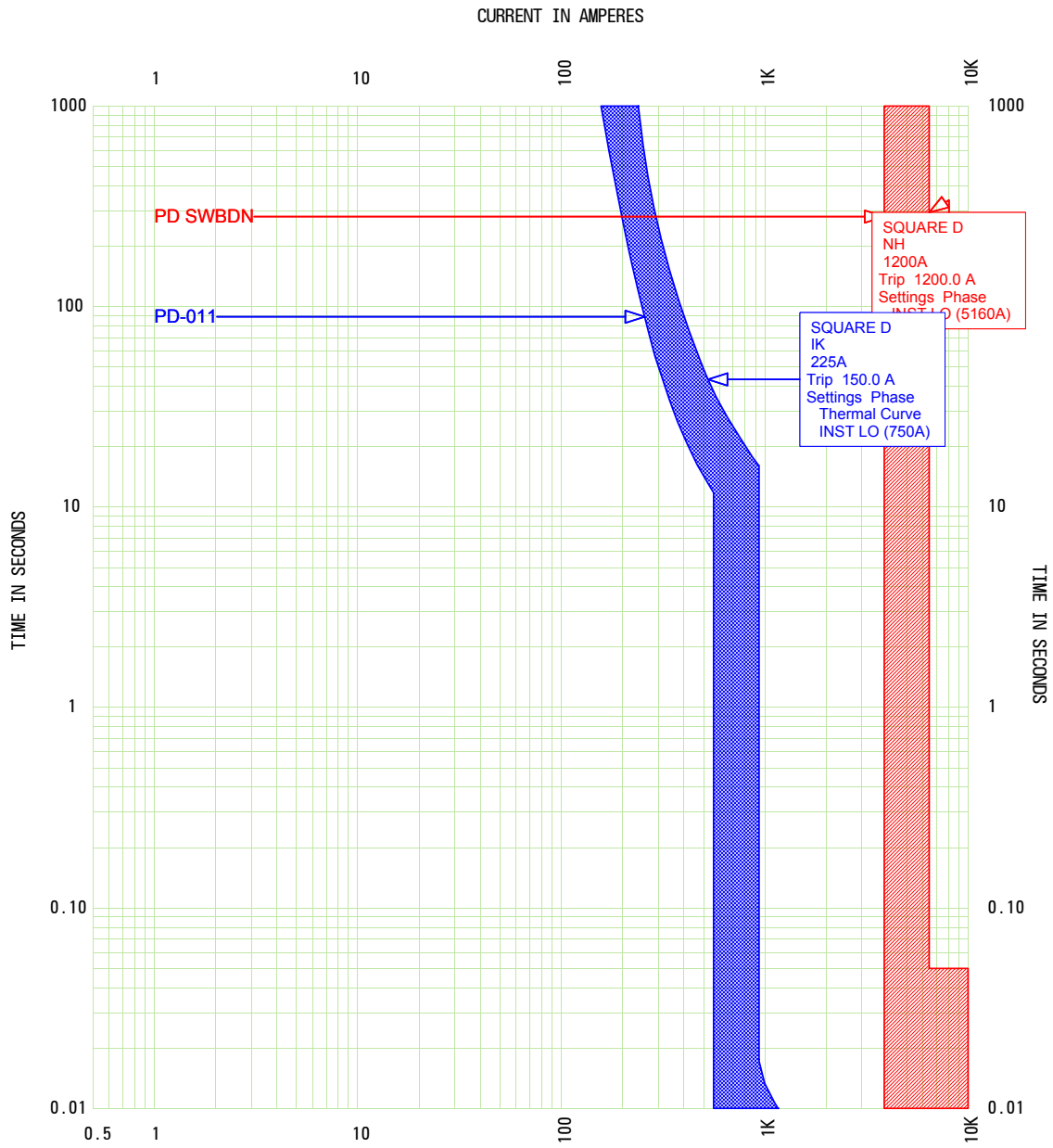
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SKM Systems Analysis, Inc.



TCC Name: CH-1
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March 17, 2010 12:55 PM

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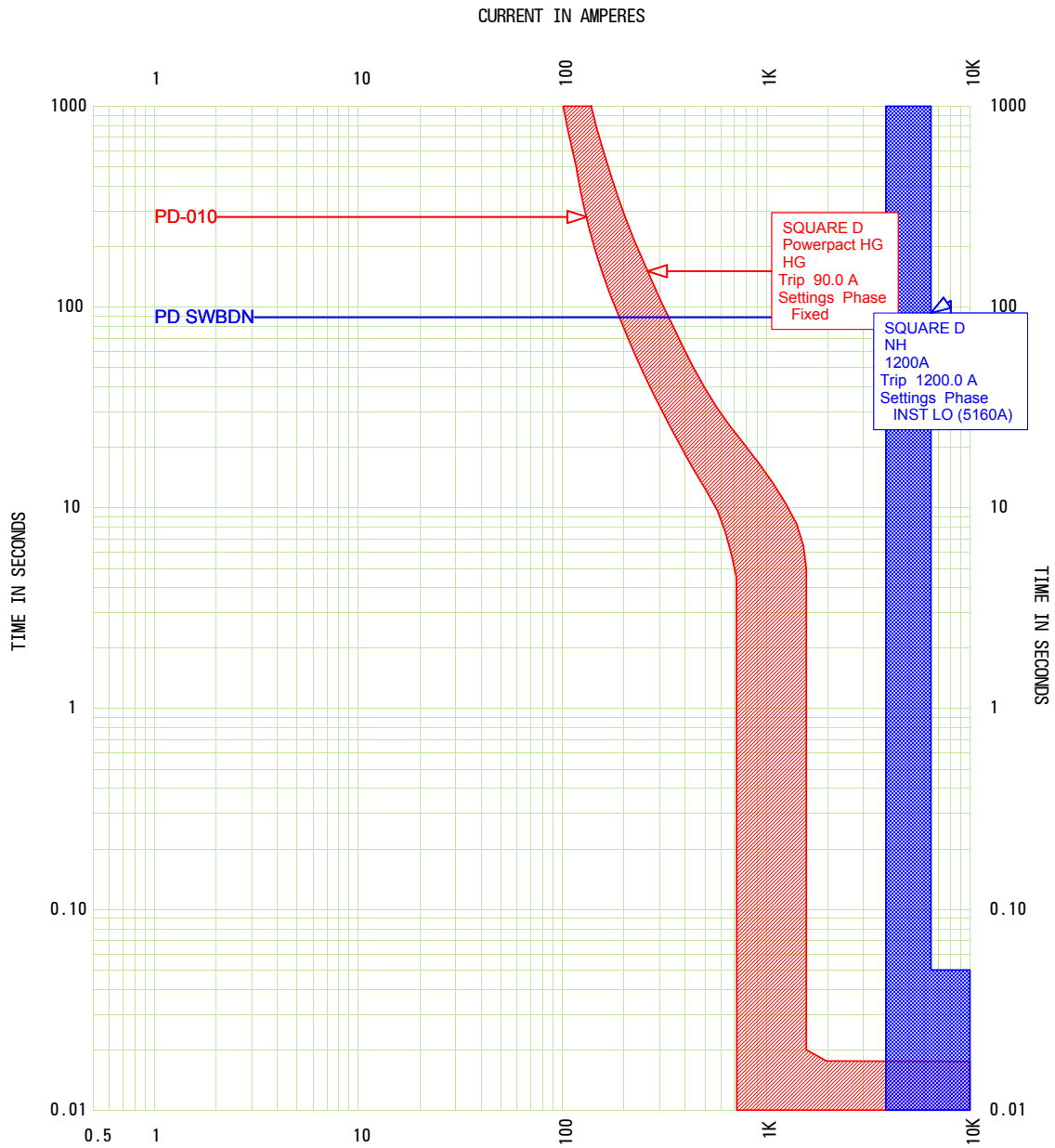
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SKM Systems Analysis, Inc.



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Online:
March 17, 2010 12:55 PM

Current Scale x 1

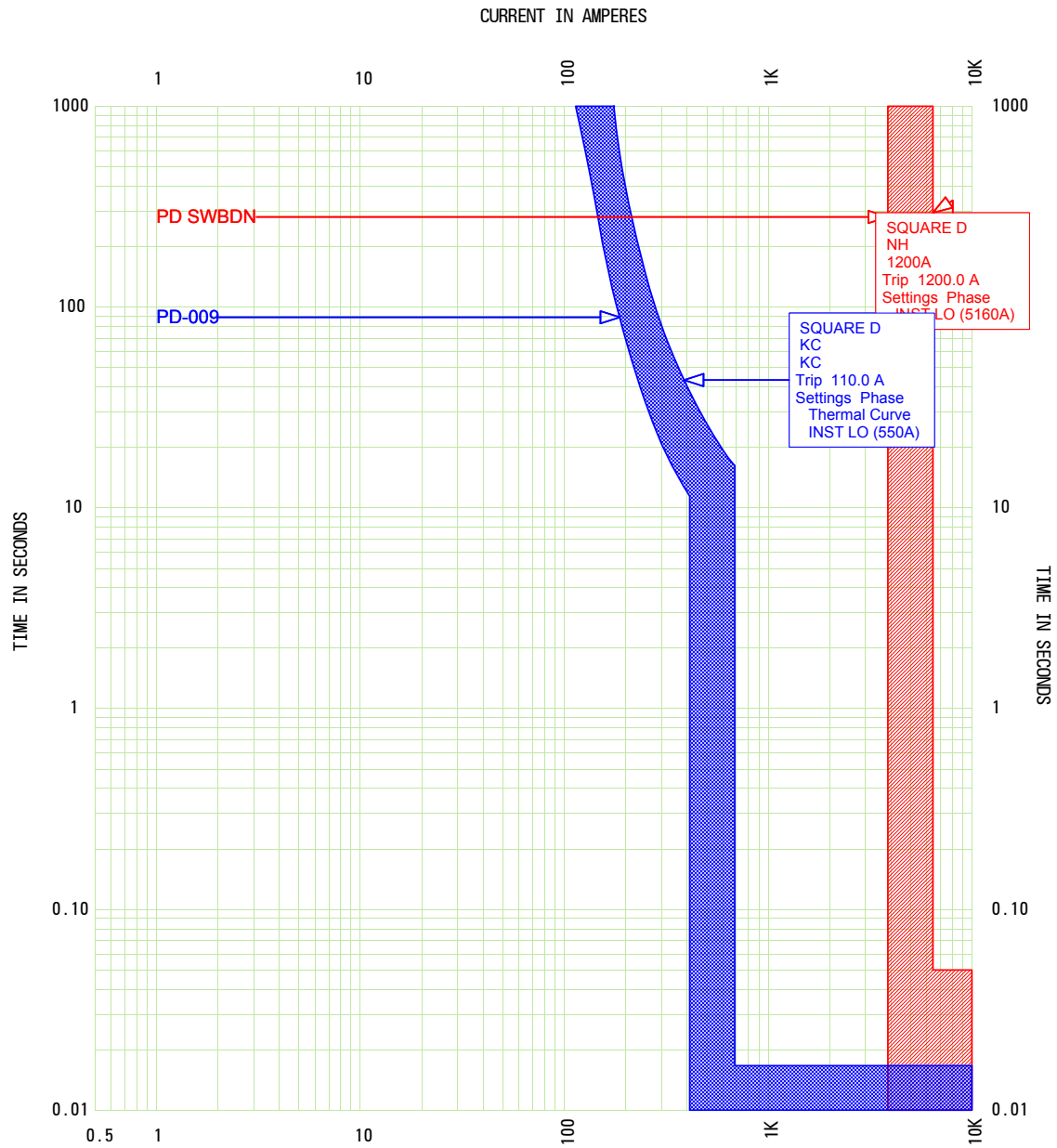
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SKM Systems Analysis, Inc.



TCC Name: AHU-2
Online:
March 17, 2010 12:55 PM

Current Scale x 1

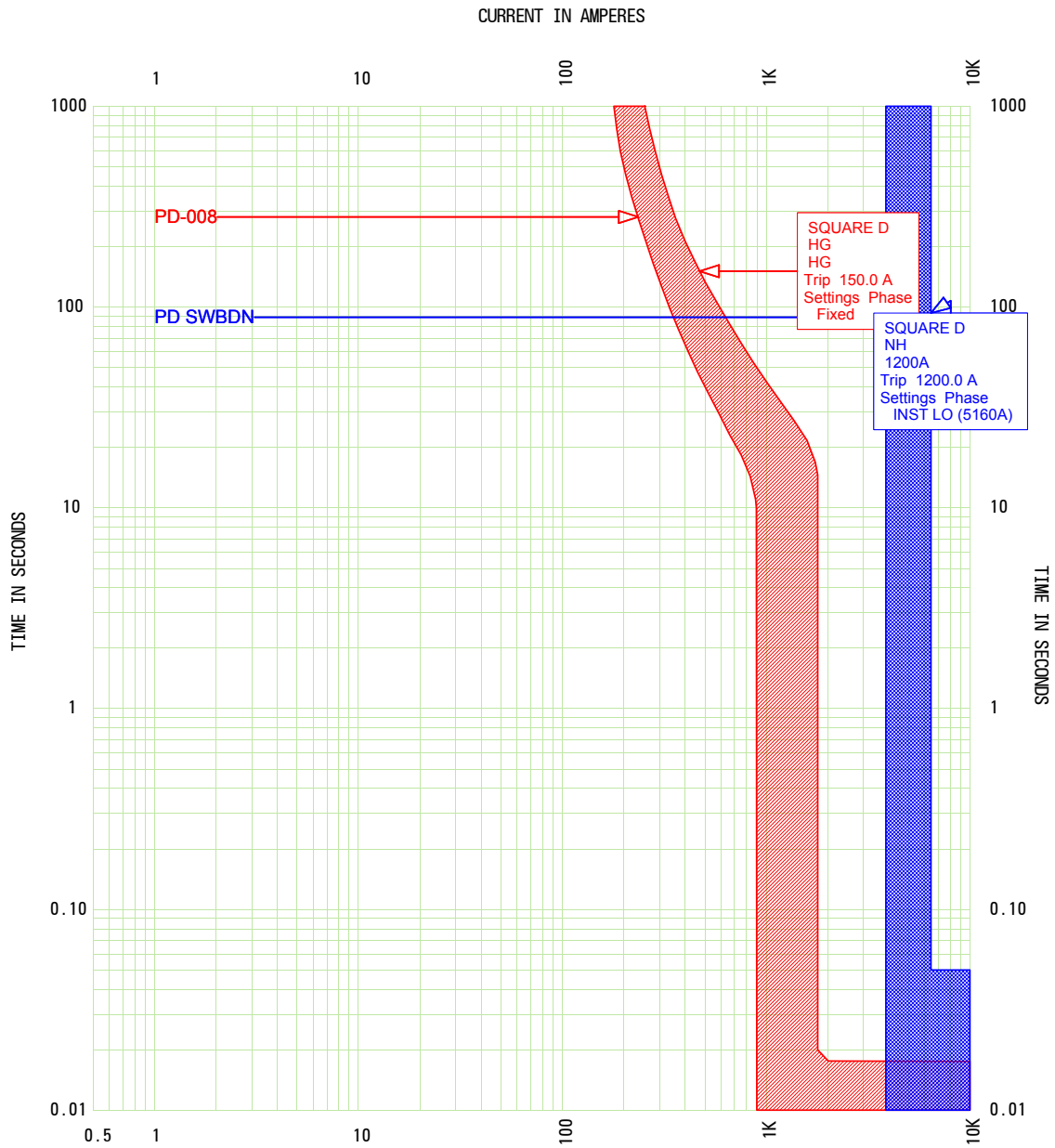
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SKM Systems Analysis, Inc.



TCC Name: AHU-1
Online:
March 17, 2010 12:55 PM

Current Scale x 1

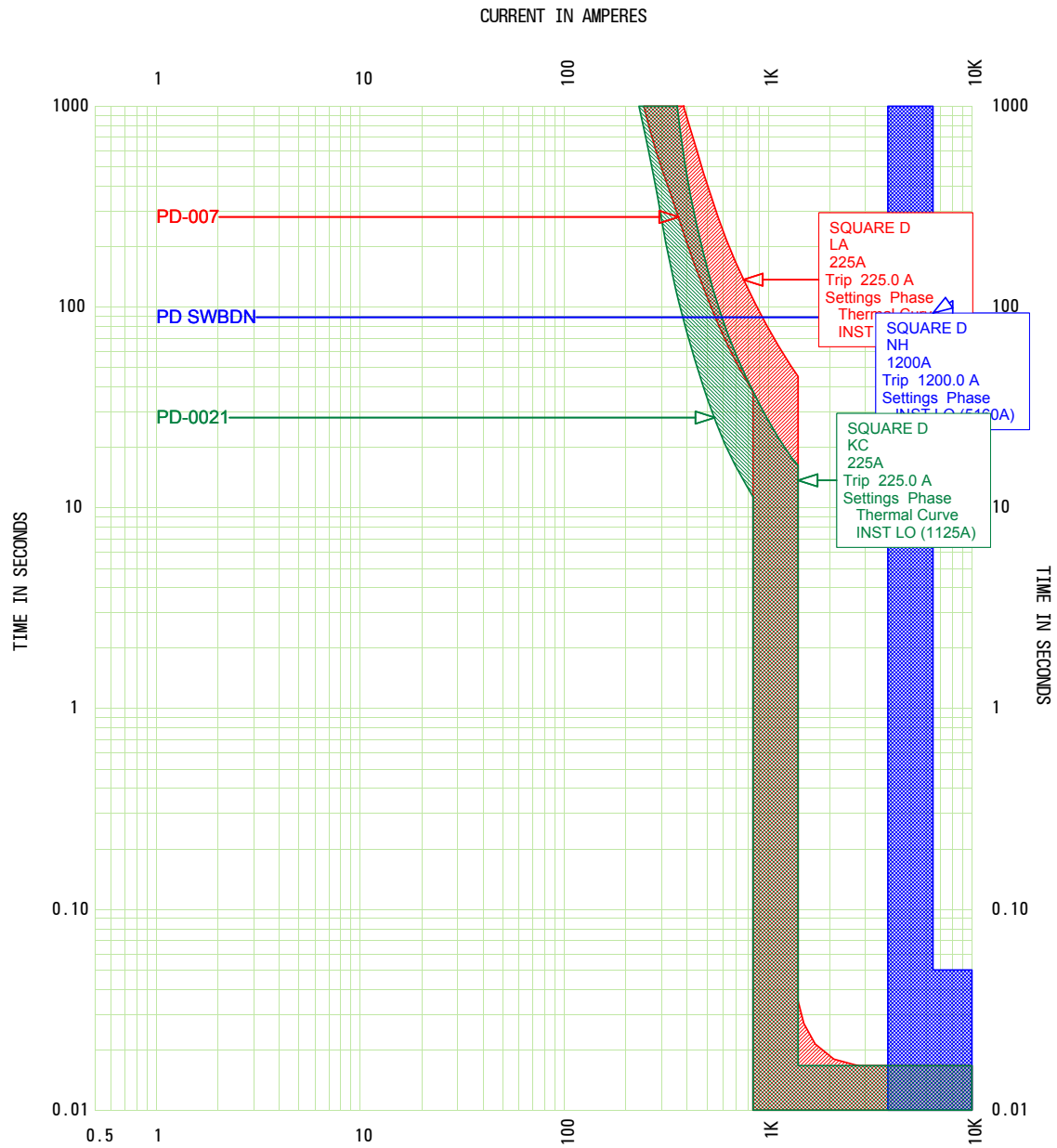
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SKM Systems Analysis, Inc.



TCC Name: ELEV
Online: ELEV
March 17, 2010 12:56 PM

Current Scale x 1

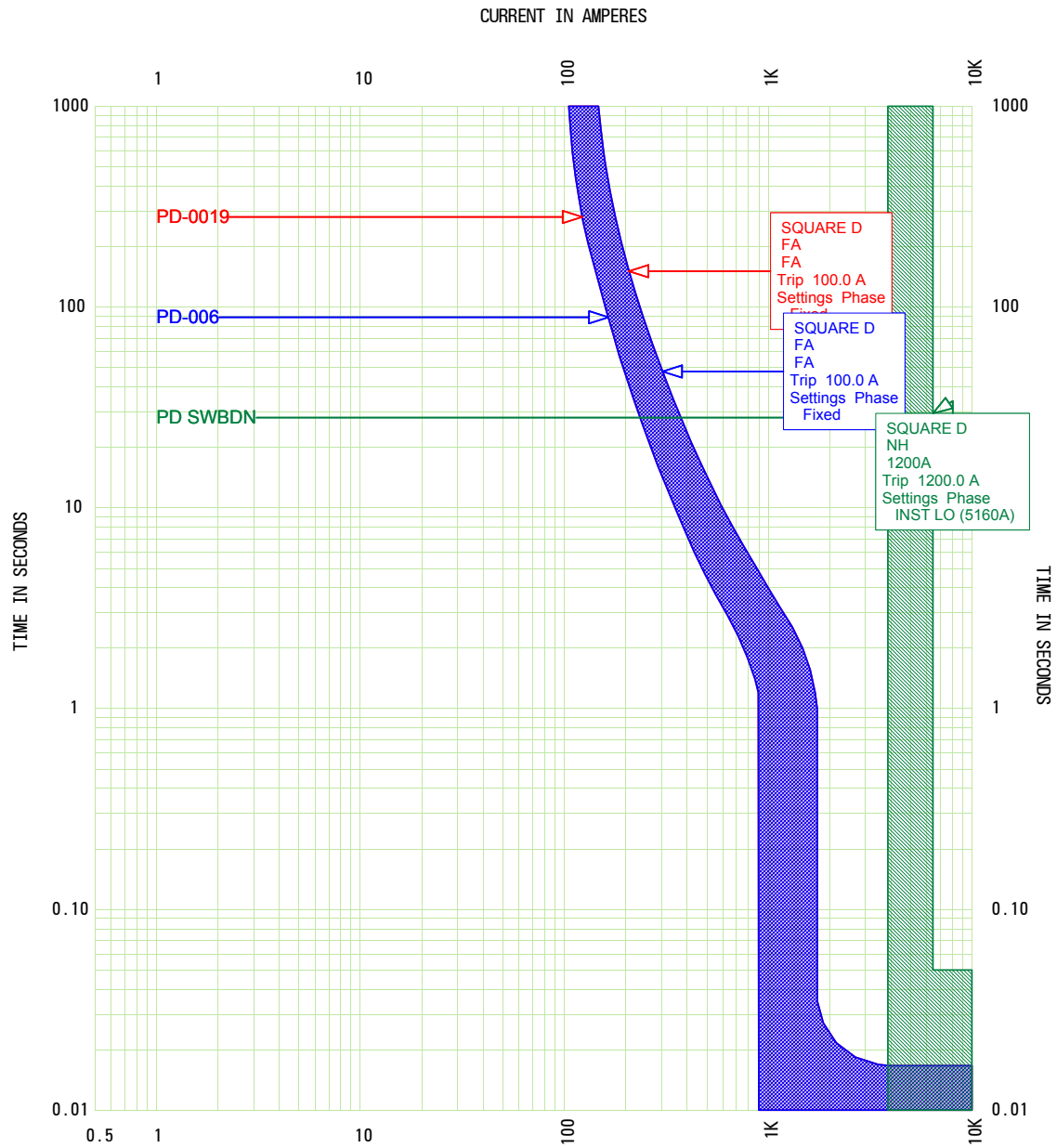
Reference Voltage: 480
SKM Systems Analysis, Inc.



TCC Name: BLNH2
Online:
March 17, 2010 12:56 PM

Current Scale x 1

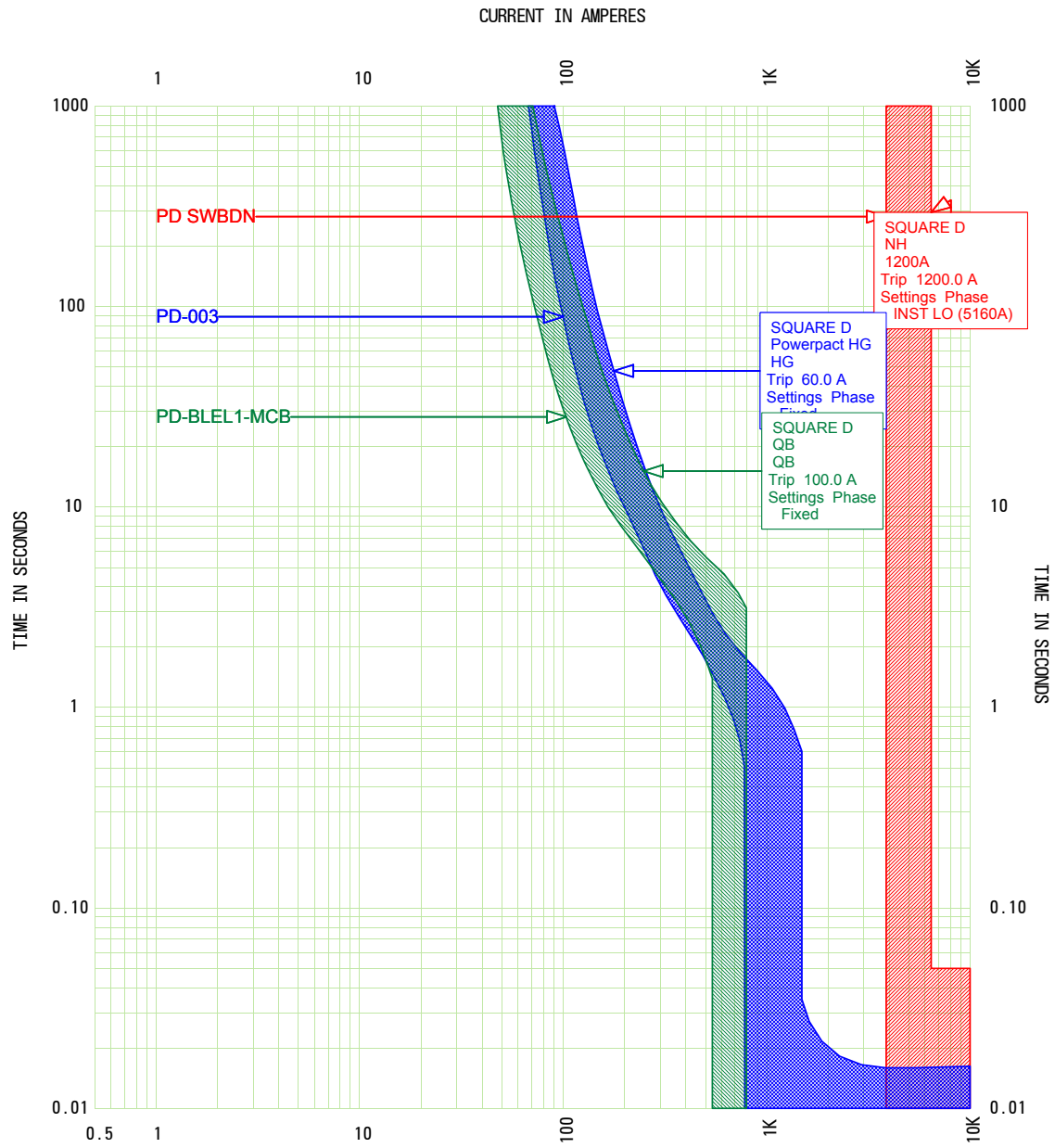
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SKM Systems Analysis, Inc.



TCC Name: BLNH1
Online:
March 17, 2010 12:56 PM

Current Scale x 1

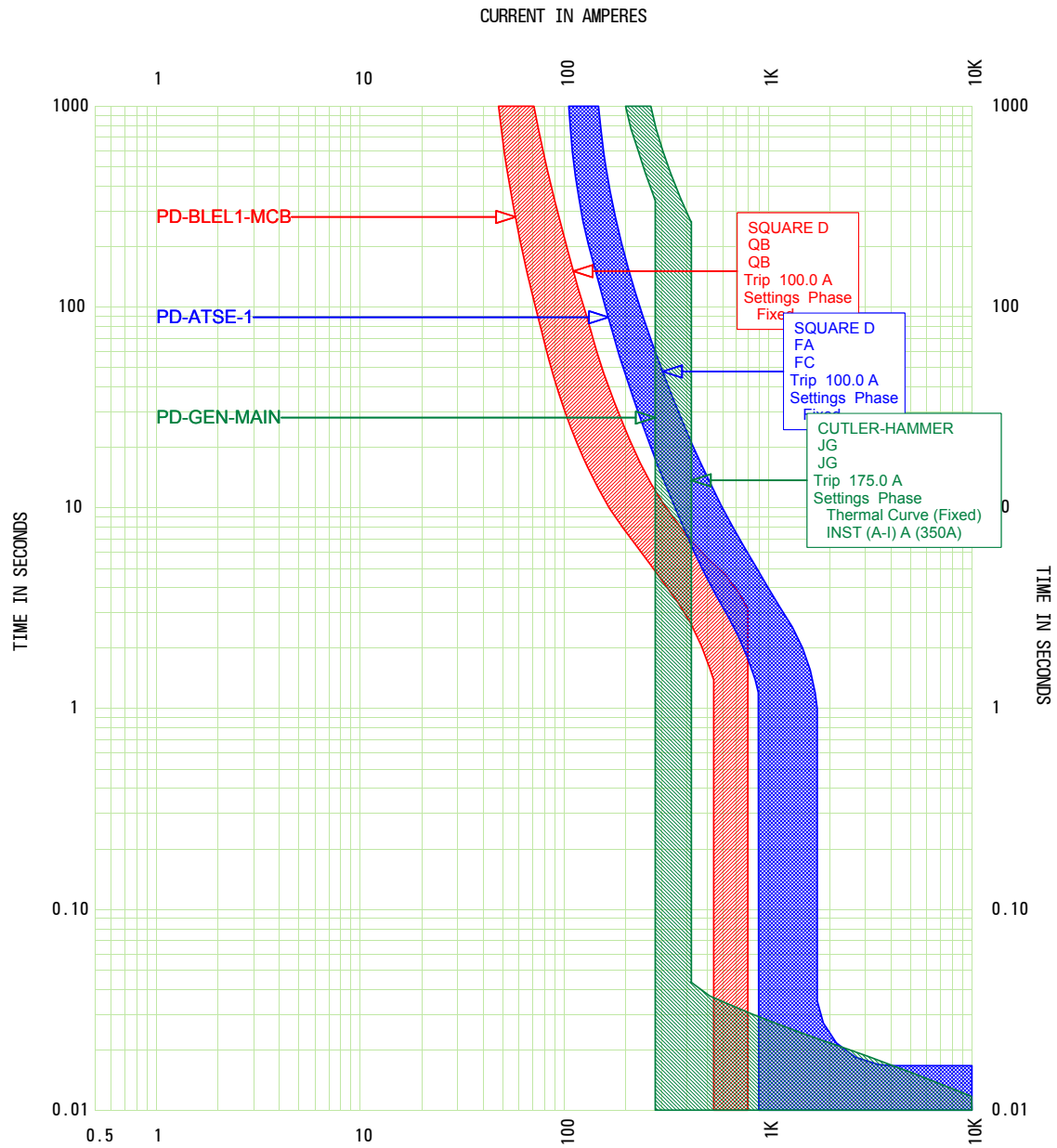
Reference Voltage: 480
SKM Systems Analysis, Inc.



TCC Name: BLEL1-N
Online:
March 17, 2010 12:56 PM

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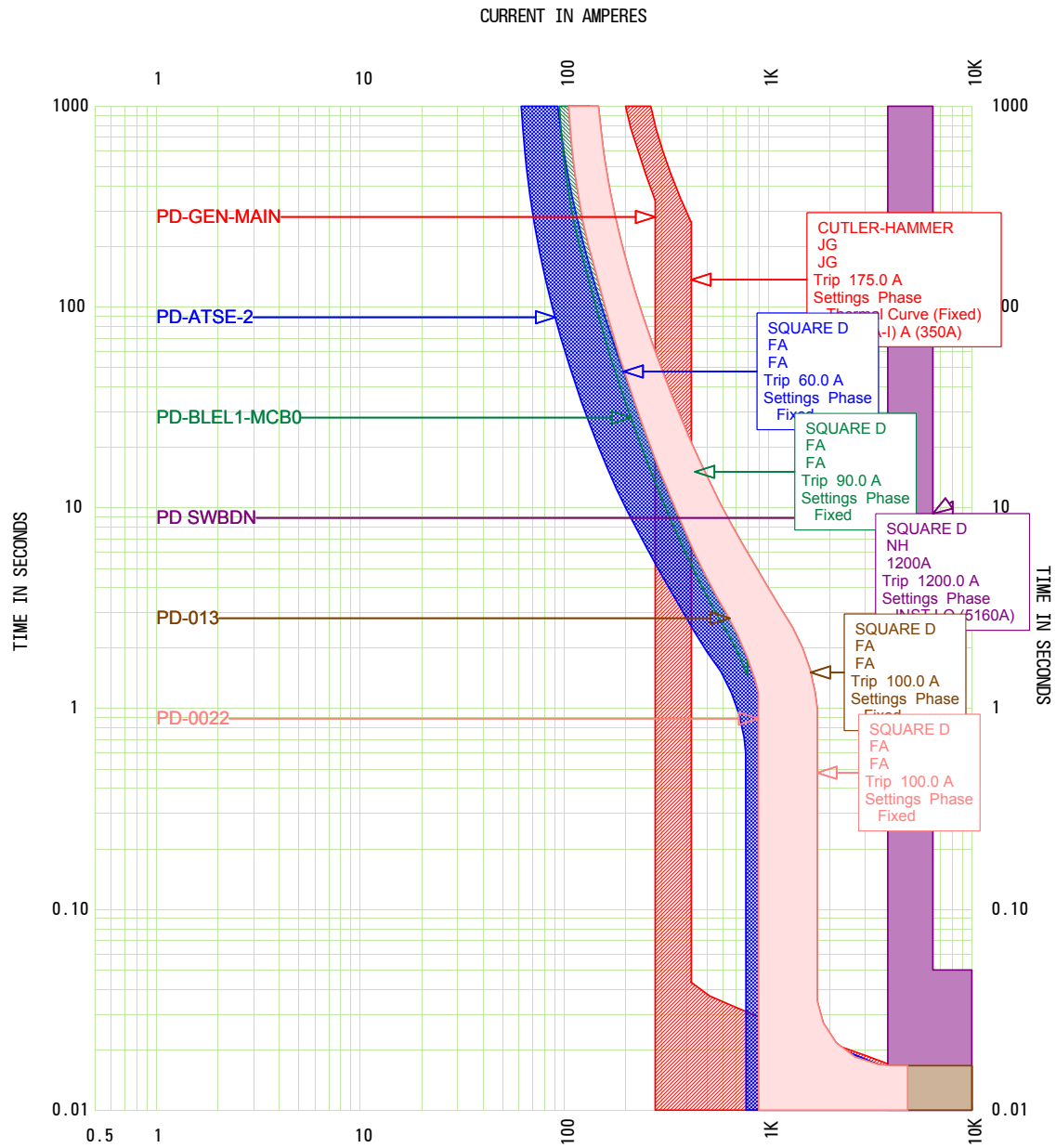
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SKM Systems Analysis, Inc.



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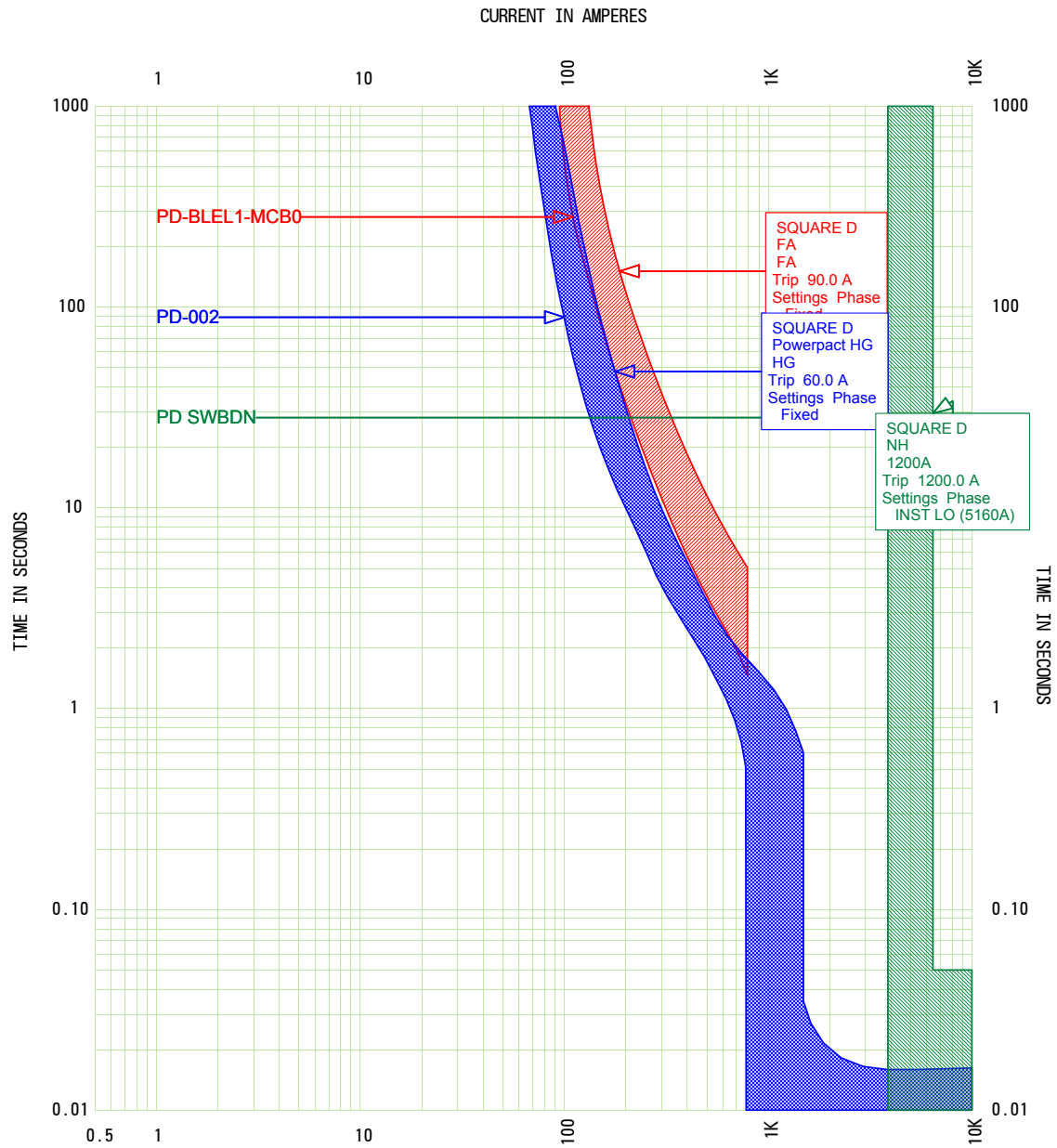
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SKM Systems Analysis, Inc.



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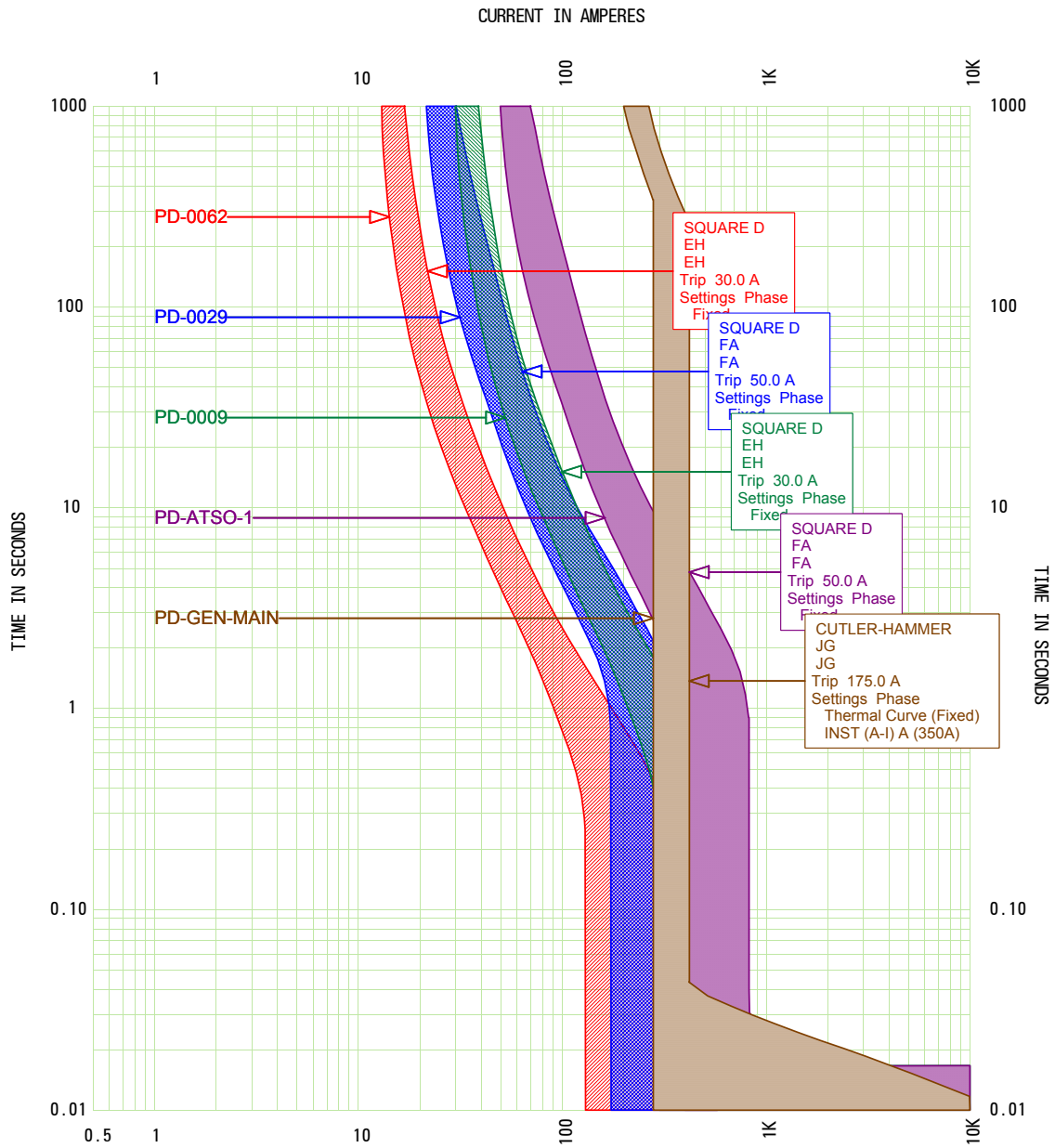
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 SKM Systems Analysis, Inc.



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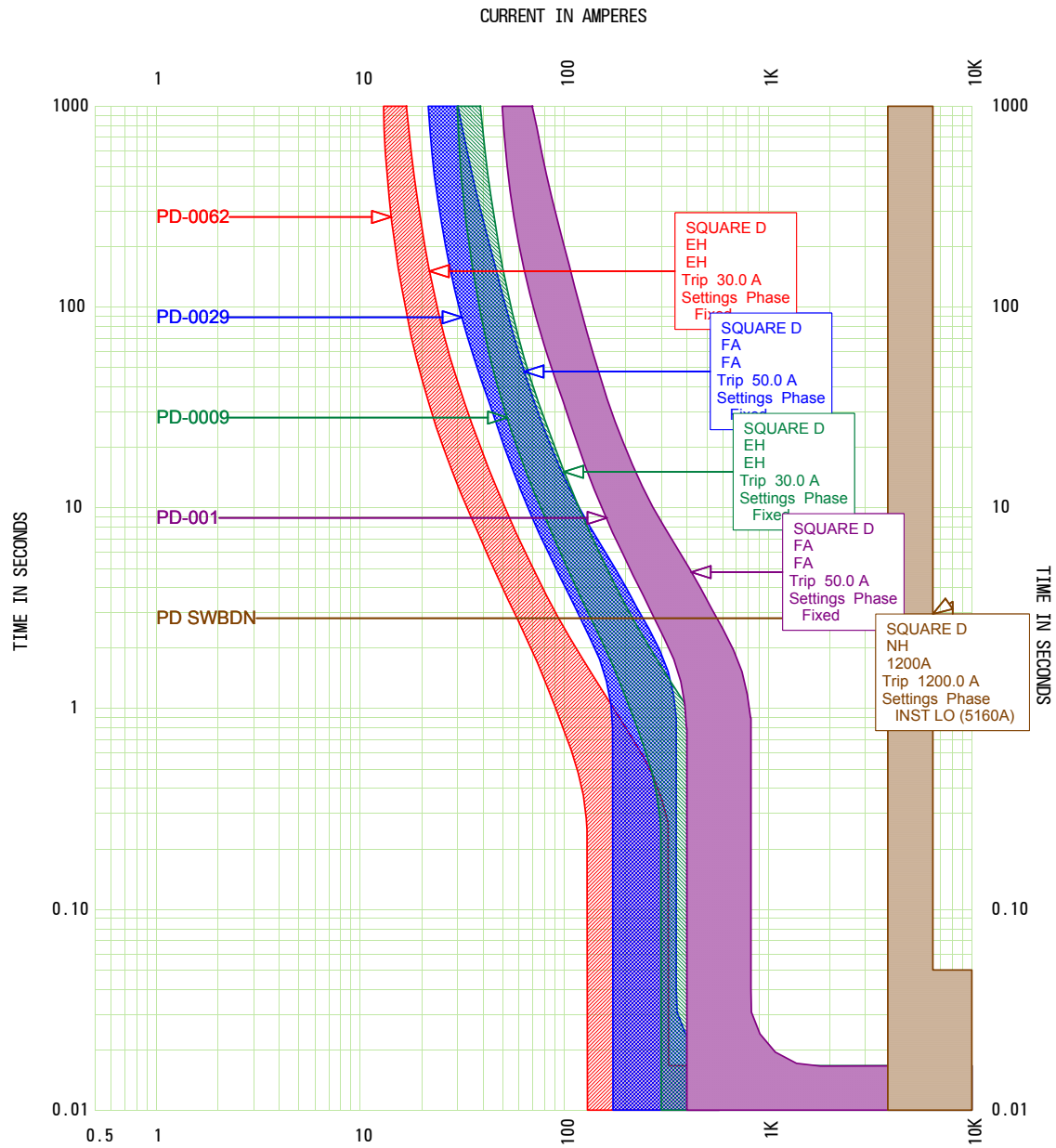
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SKM Systems Analysis, Inc.



TCC Name: 1LOL1-E
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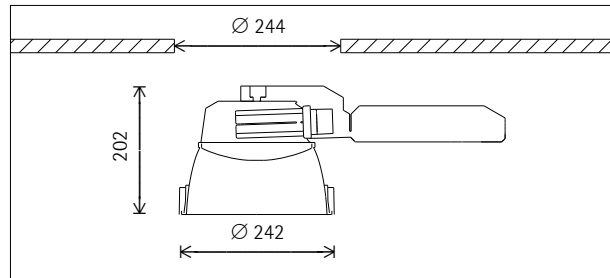
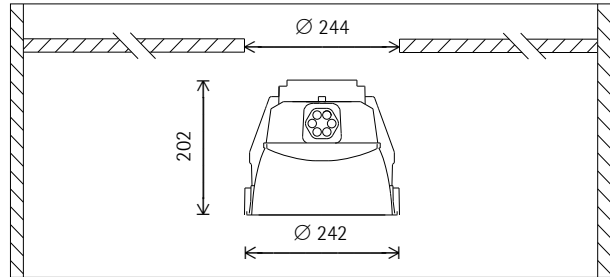
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 SKM Systems Analysis, Inc.



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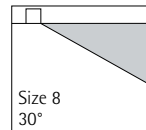
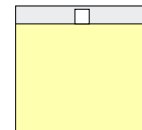
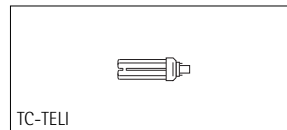
Reference Voltage: 480
SKM Systems Analysis, Inc.



47655.000 Reflector silver
TC-TELI 32W GX24q-3 2400lm
ECG DALI
Flush mounting detail

Product description

Housing and fixing ring: plastic, black.
Fixing of the beam direction.
Mounting ring: plastic, white (RAL9002). Mounting for ceiling thicknesses of 1-30mm with covered mounting detail and 12.5-25mm with flush mounting detail.
Junction box for through-wiring, 5-pole terminal block, integrated strain relief. Electronic control gear, plug and play connectivity with DALI version.
Darklight reflector with Spherolit technology wallwasher segments: aluminium, bright anodised. Cut-off angle 30°.
Wide diffuser: plastic, translucent.
Available from 2nd quarter 2010
Weight 1.80kg



Planning data

Illuminance E_n (lx)

Specifications:

Number of luminaires $n > 5$

Wall height (m) 3

TC-TELI 32W GX24q-3 2400lm

Offset from wall (m)	0.90		0.90		1.20		1.20	
Luminaire spacing (m)	0.90		1.20		1.20		1.50	
	below the luminaire	between the luminaires	below the luminaire	between the luminaires	below the luminaire	between the luminaires	below the luminaire	between the luminaires
0.250	46	42	38	28	16	15	14	11
0.500	140	127	117	86	51	47	44	34
0.750	211	214	169	150	93	84	80	62
1.000	237	232	178	176	119	120	99	92
1.250	229	227	176	167	132	131	105	105
1.500	205	203	155	154	133	130	108	103
1.750	176	174	134	134	126	125	103	100
2.000	149	147	116	115	115	114	93	93
2.250	126	124	100	99	103	102	84	83
2.500	106	105	85	85	91	90	75	74
2.750	90	88	73	73	81	79	67	66

Cleaning (a)	1				2				3			
Ambient conditions	P	C	N	D	P	C	N	D	P	C	N	D
LMF	0.94	0.88	0.82	0.77	0.91	0.83	0.77	0.71	0.89	0.79	0.73	0.65
RSMF	0.96	0.92	0.87	0.81	0.96	0.92	0.87	0.81	0.96	0.92	0.87	0.81

Hours of operation (h)	2000	6000	10000	1000	4000	8000
LLMF	0.94	0.89	0.85	0.97	0.91	0.87
LSF	1	1	1	1	1	1

MF	LMFxRSMFxLLMFxLSF
MF	Maintainance Factor
LMF	Luminaire Maintenance Factor
RSMF	Room Surface Maintenance Factor
LLMF	Lamp Lumens Maintenance Factor
LSF	Lamp Survival Factor
P	Room pure
C	Room clean
N	Room normal
D	Room dirty

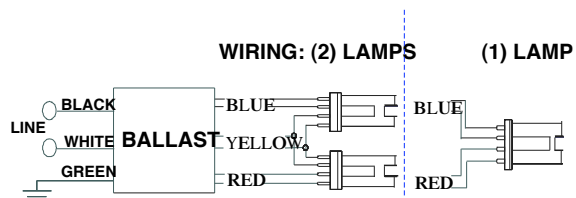
ICF-2S26-H1-LD@277

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

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (ANSI Watts)	Ballast Factor	MAX THD %	Power Factor	MAX Lamp Current Crest Factor	B.E.F .
CFM26W/GX24Q	1	26	0/-18	0.11	29	1.10	10	0.98	1.5	3.79
CFM26W/GX24q	2	26	0/-18	0.20	54	1.00	10	0.99	1.5	1.85
* CFM32W/GX24q	1	32	0/-18	0.13	36	0.98	10	0.98	1.5	2.72
CFM42W/GX24q	1	42	0/-18	0.17	46	0.98	10	0.98	1.5	2.13
CFQ26W/G24q	1	26	0/-18	0.10	27	1.00	10	0.98	1.5	3.70
CFQ26W/G24q	2	26	0/-18	0.19	51	1.00	10	0.99	1.5	1.96
CFS21W/GR10q	2	21	0/-18	0.18	51	1.12	10	0.99	1.5	2.20
FT24W/2G11	2	24	0/-18	0.18	48	0.93	10	0.99	1.5	1.94

Wiring Diagram



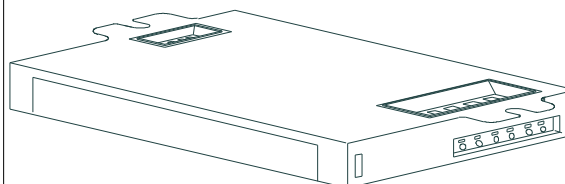
Green Terminal must be Grounded

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

Standard Lead Length (inches)

	in.	cm.		in.	cm.
Black	0.0		Yellow/Blue		
White	0.0		Blue/White		
Blue	0.0		Brown		
Red	0.0		Orange		
Yellow	0		Orange/Black		
Gray			Black/White		
Violet			Red/White		

Enclosure



Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
4.98 "	2.4 "	1.0 "	4.6 "
4 49/50	2 2/5	1	4 3/5
12.6 cm	6.1 cm	2.5 cm	11.7 cm

Revised 09/02/2004



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

PHILIPS LIGHTING ELECTRONICS N.A.

10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018

Tel: 800-322-2086 · Fax: 888-423-1882 · www.philips.com/advance

Customer Support/Technical Service: 800-372-3331 · OEM Support: 866-915-5886

ICF-2S26-H1-LD@277

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

Electrical Specifications

Notes:

Section I - Physical Characteristics

- 1.1 Ballast shall be physically interchangeable with standard electromagnetic or standard electronic ballasts, where applicable.
- 1.2 Ballast shall be available in a plastic/metal can or all metal can construction to meet all plenum requirements.
- 1.3 Ballast shall be provided with poke-in wire trap connectors color coded per ANSI C82.11.

Section II - Performance Requirements

- 2.1 Ballast shall be Programmed Start except for ballasts with -QS suffix, which shall be Rapid Start.
- 2.2 Ballast shall contain auto restart circuitry in order to restart lamps without resetting power.
- 2.3 Ballast shall operate from 50/60 Hz input source of 120V through 277V with sustained variations of +/- 10% (voltage and frequency) with no damage to the IntelliVolt ballast. RCF models shall operate from 60 Hz input source of 120V with sustained variations of +/- 10% (voltage and frequency) with no damage to the ballast.
- 2.4 Ballast shall be high frequency electronic type and operate lamps at a frequency above 42 kHz to avoid interference with infrared devices and eliminate visible flicker.
- 2.5 Ballast shall have a Power Factor greater than 0.98 for primary lamp.
- 2.6 Ballast shall have a minimum ballast factor of 1.00 for primary lamp application.
- 2.7 Ballast shall provide for a Lamp Current Crest Factor of 1.7 or less in accordance with lamp manufacturer recommendations.
- 2.8 Ballast input current shall have Total Harmonic Distortion (THD) of less than 10% when operated at nominal line voltage with primary lamp.
- 2.9 Ballast shall have a Class A sound rating.
- 2.10 Ballast shall have a minimum starting temperature of -18C (0F) for primary lamp. Ballasts for PL-H lamps shall have a minimum starting temperature of -30C (-20F) for primary lamp.
- 2.11 Ballast shall provide Lamp EOL Protection Circuit.
- 2.12 Ballast shall tolerate sustained open circuit and short circuit output conditions without damage.

Section III - Regulatory Requirements

- 3.1 Ballast shall not contain any Polychlorinated Biphenyl (PCB).
- 3.2 Ballast shall be Underwriters Laboratories (UL) listed, Class P and Type 1 Outdoor; and Canadian Standards Association (CSA) certified where applicable.
- 3.3 Ballast shall be rated for use in air-handling spaces.
- 3.4 Ballast shall comply with ANSI C62.41 Category A for Transient protection.
- 3.5 Ballast shall comply with ANSI C82.11 where applicable.
- 3.6 Ballast shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 18, Non-Consumer (Class A) for EMI/RFI (conducted and radiated).

Section IV - Other

- 4.1 Ballast shall be manufactured in a factory certified to ISO 9002 Quality System Standards.
- 4.2 Ballast shall carry a five-year warranty from date of manufacture against defects in material or workmanship, including replacement, for operation at a maximum case temperature of 75C and three-years for a maximum case temperature of 85C (90C 3year warranty for ICF1H120-M4-XX, ICF2S42-90C-M2-XX and ICF2S70-M4-XX models).
- 4.3 Manufacturer shall have a fifteen-year history of producing electronic ballasts for the North American market.

Revised 09/02/2004



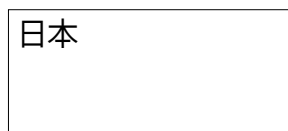
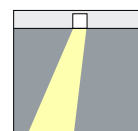
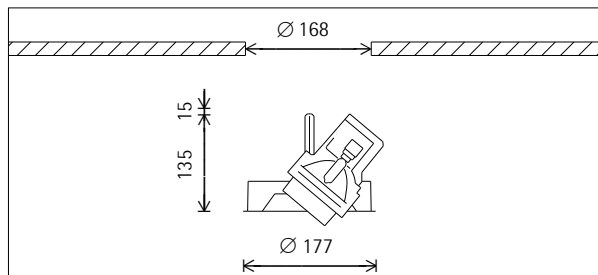
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46459.000 Reflector silver
HIT-TC-CE 20W GU6.5 1615lm
HIT-TC-CE 35W GU6.5 3400lm
Covered mounting detail
Spherolit reflector, flood

Product description

Size 5

Lampholder carrier: cast aluminium, 0°-40° tilt, 360° rotation. Lockable angles of tilt and rotation.

Flush cassette for lampholder carriers: plastic, white.

Mounting ring: plastic, white (RAL9002). Mounting for ceiling thicknesses of 1-30mm with covered mounting detail and 12.5-25mm with flush mounting detail.

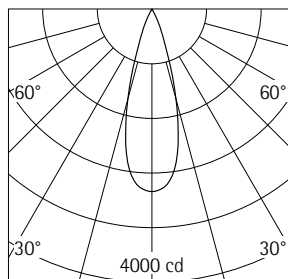
Cable with plug, L 500mm.

Reflector: aluminium, anodised, mirror-finish. Safety glass.

Anti-dazzle ring: cast aluminium, internal black lacquered, external white (RAL9002) powder-coated.

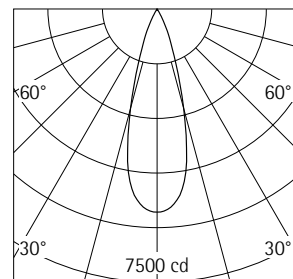
Control gear to be ordered separately.

Weight 0.90kg



HIT-TC-CE 20W GU6.5 1615lm

h(m)	E(lx)	D(m)
		30°
1	2673	0.54
2	668	1.07
3	297	1.61
4	167	2.14
5	107	2.68



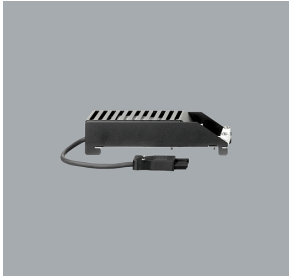
HIT-TC-CE 35W GU6.5 3400lm

h(m)	E(lx)	D(m)
		30°
1	5574	0.54
2	1393	1.07
3	619	1.61
4	348	2.14
5	223	2.68

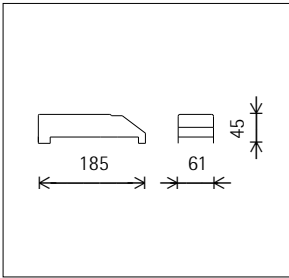
Planning data

Cleaning (a)	1				2				3			
Ambient conditions	P	C	N	D	P	C	N	D	P	C	N	D
LMF	0.94	0.88	0.82	0.77	0.91	0.83	0.77	0.71	0.89	0.79	0.73	0.65
RSMF	0.96	0.92	0.87	0.81	0.96	0.92	0.87	0.81	0.96	0.92	0.87	0.81
Hours of operation (h)	1000	2000	4000	6000	8000	9000						
LLMF	0.94	0.86	0.82	0.75	0.69	0.66						
LSF	1	1	1	1	1	1						
MF	LMFxRSMFxLLMFxLSF											
MF	Maintenance Factor											
LMF	Luminaire Maintenance Factor											
RSMF	Room Surface Maintenance Factor											
LLMF	Lamp Lumens Maintenance Factor											
LSF	Lamp Survival Factor											
P	Room pure											
C	Room clean											
N	Room normal											
D	Room dirty											

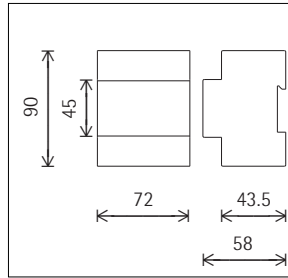
Accessories



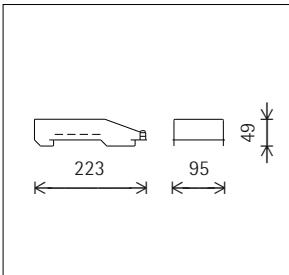
83669.000
Control gear
for HIT-TC-CE 20W, G8.5 and GU6.5 and
HIT-CE 20W, G12 and HIPAR51-CE-P
20W, GX10.
Metal, black powder-coated.
Electronic control gear 220-240V, 50-
60Hz. Strain relief. Through-wiring pos-
sible. 5-pole terminal block. Luminaire
connection cable with plug connection,
L 200mm.
Weight 0.36kg

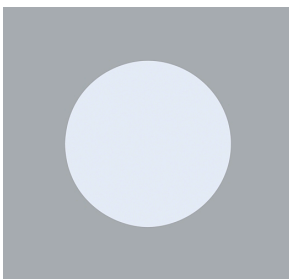
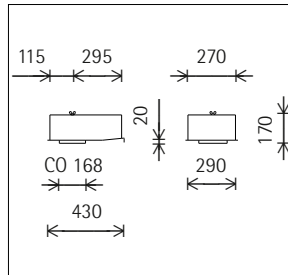
83816.000
DALI switch actuator, double, 16A
Two voltage-free contacts for switching
ohmic, inductive and capacitive loads
max 16A.
DALI interface with two independent
addresses.
Mounting on DIN rail.
Weight 0.21kg



83655.000
Control gear
for HIT-TC-CE 35W, GU6.5 and HIT-CE
35W, G12.
Metal, black powder-coated.
Electronic control gear 220-240V, 50-
60Hz. 5-pole terminal block. Strain
relief. Through-wiring possible. Con-
nection cable with plug, L 200mm.
Weight 0.65kg



83613.000
Concrete housing
Metal, powder-coated.
Recommended 0-8mm aggregate for
the concrete.
Weight 3.00kg



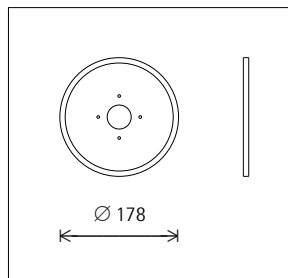
77198.000
UV filter



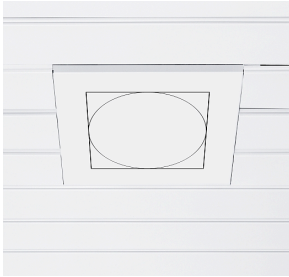
83596.000
Spacer plate
Aluminium.
For flush-mounting of downlights in
concrete housings in exposed concrete
ceilings.
Weight 0.10kg
Only in conjunction with:
83613.000



70647.000
Food filter



Accessories



82950.000

Mounting plate for panelled ceilings
Metal, white (RAL9002) powder-coated.
Individual design of mounting plates
according to ceiling type and luminaire.
Quote ceiling type and dimensions.

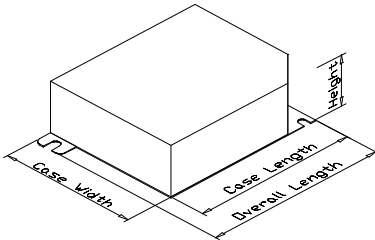
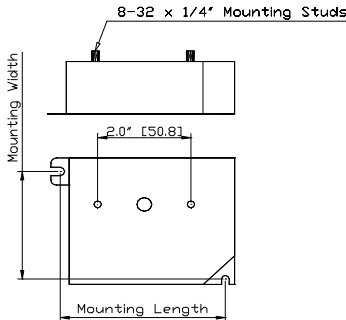
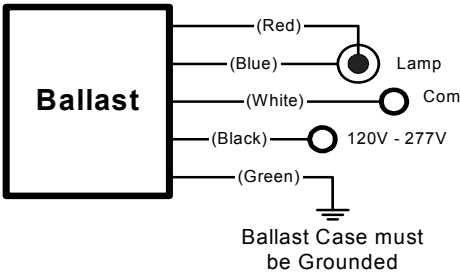
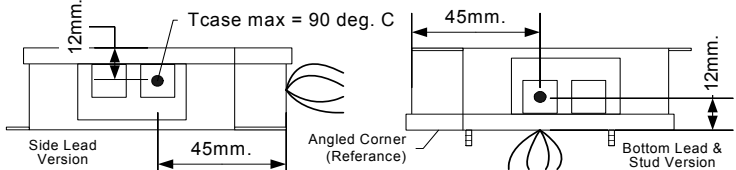


83980.000

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

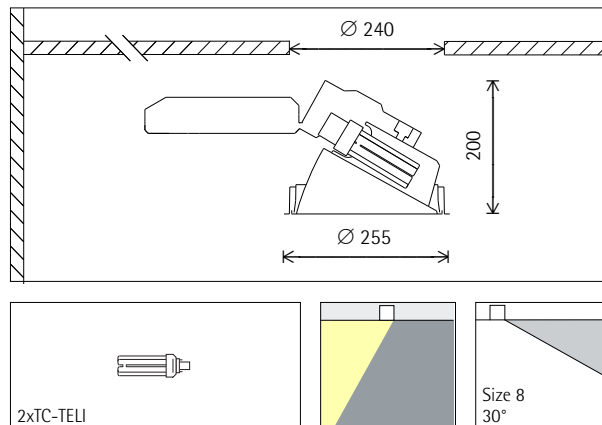
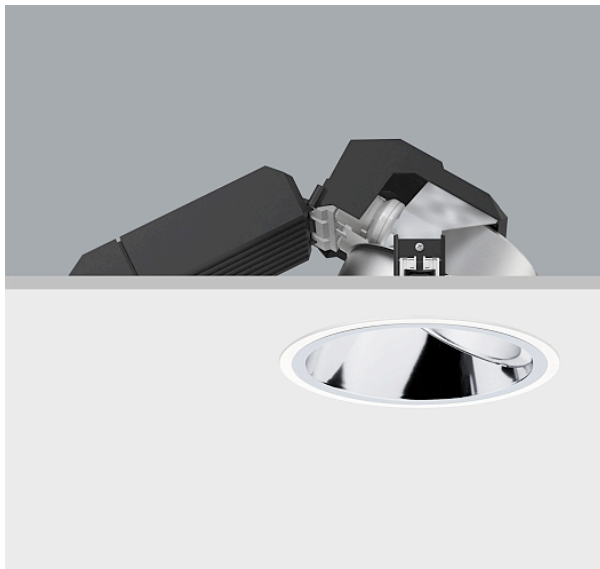
Type D2, D4, D5, D7

Revised: 6/4/2009

PHILIPS ADVANCE				e-Vision® Electronic Ballast for Metal Halide Lamps			Catalog Number: IMH-P39-G For 39W Philips Mini Master Color Lamps ANSI C179 120-277 50/60Hz Electronic Status: RELEASED																	
DIMENSIONS AND DATA																								
Lamp		Input Volts	Catalog Number*	Line Current (Amps)	Input Power (Watts)	Min Power Factor	Wiring Diag	Fig.	Weight (lb)	Max. Distance to Lamp (ft)														
Number	Watts																							
39W Watt Lamp, ANSI Code C179 Minimum Starting Temp -30°C/-20°F																								
1	39	120 277	IMH-P39-G-XXX	0.39 0.17	46 45	0.95	3	G	0.9	5														
																								
<table><tr><td>Case Figure</td><td>Overall Length</td><td>Case Length</td><td>Case Width</td><td>Height</td><td>Mountin Length</td><td>Mounting Width</td></tr><tr><td>G</td><td>97mm [3.8"]</td><td>90mm [3.5"]</td><td>77mm [3.0"]</td><td>30mm [1.2"]</td><td>87mm [3.4"]</td><td>67mm [2.6"]</td></tr></table>							Case Figure	Overall Length	Case Length	Case Width	Height	Mountin Length	Mounting Width	G	97mm [3.8"]	90mm [3.5"]	77mm [3.0"]	30mm [1.2"]	87mm [3.4"]	67mm [2.6"]	Wiring Diagram 3			
Case Figure	Overall Length	Case Length	Case Width	Height	Mountin Length	Mounting Width																		
G	97mm [3.8"]	90mm [3.5"]	77mm [3.0"]	30mm [1.2"]	87mm [3.4"]	67mm [2.6"]																		
																								
INSTALLATION & APPLICATION NOTES:							*Ordering Information																	
1. Maximum allowable case temperature is 90°C. See figure above for measurement location							Order Suffix	Description																
2. Ignition pulse is 2.5 kV max							-LF	Ballast with side exit leads and mounting feet																
3. All leads are 9 inches long							-BLS	Ballast with bottom exit leads and mounting studs																
4. Ballast output will shutdown after 20 minutes if lamp fails to ignite																								
5. Power must be cycled off – then on, after replacing lamp																								
Data is based on tests performed by Philips Advance in a controlled environment and is representative of relative performance. Actual performance can vary depending on operating conditions. Specifications are subject to change without notice. All specifications are nominal unless otherwise noted.																								

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Tel: 800-322-2086 • Fax: 800-423-1882 • Customer Support: 800-372-3331 • OEM Support: 866-915-5886



46672.000 Reflector silver
2xTC-TELI 32W GX24q-3 2400lm
ECG
Covered mounting detail

Product description

Housing and fixing ring: plastic, black.
Fixing of the beam direction.
Mounting ring: plastic, white (RAL9002). Mounting for ceiling thicknesses of 1-30mm with covered mounting detail and 12.5-25mm with flush mounting detail.
Junction box for through-wiring, 5-pole terminal block, integrated strain relief. Electronic control gear, plug and play connectivity with DALI version.
Darklight reflector: aluminium, bright anodised. Cut-off angle 30°.
Available from 2nd quarter 2010
Weight 1.70kg

Planning data

Illuminance E_n (lx)

Specifications:

Number of luminaires $n > 5$

Wall height (m) 4

TC-TELI 32W GX24q-3 2400lm

Offset from wall (m)	0.90			1.20			1.20
Luminaire spacing (m)	1.20			1.20			1.50
	below the luminaire	between the luminaires		below the luminaire	between the luminaires	below the luminaire	between the luminaires
0.250	171	210		86	108	77	76
0.500	434	420		224	223	179	186
0.750	537	565		352	351	282	280
1.000	526	607		399	441	322	344
1.250	480	567		398	462	319	370
1.500	414	473		388	433	303	359
1.750	350	381		356	385	280	325
2.000	292	306		315	329	250	280
2.250	243	249		271	280	220	238
2.500	201	206		231	238	192	202
2.750	169	170		199	201	167	172
3.000	142	141		171	171	144	147
3.250	119	119		147	146	125	127
3.500	101	101		126	125	109	110
3.750	86	86		109	108	95	95

Cleaning (a)	1				2				3			
Ambient conditions	P	C	N	D	P	C	N	D	P	C	N	D
LMF	0.94	0.89	0.81	0.75	0.91	0.80	0.69	0.59	0.87	0.74	0.61	0.52
RSMF	0.96	0.92	0.87	0.81	0.96	0.92	0.87	0.81	0.96	0.92	0.87	0.81

Hours of operation (h)	2000	6000	10000	1000	4000	8000
LLMF	0.94	0.89	0.85	0.97	0.91	0.87
LSF	1	1	1	1	1	1

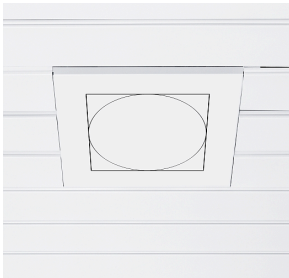
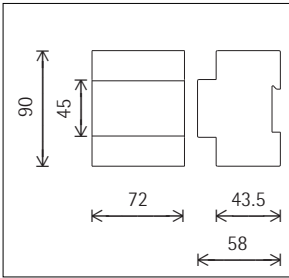
MF	LMFxRSMFxLLMFxLSF
MF	Maintainance Factor
LMF	Luminaire Maintenance Factor
RSMF	Room Surface Maintenance Factor
LLMF	Lamp Lumens Maintenance Factor
LSF	Lamp Survival Factor
P	Room pure
C	Room clean
N	Room normal
D	Room dirty

Accessories



83816.000

DALI switch actuator, double, 16A
Two voltage-free contacts for switching
ohmic, inductive and capacitive loads
max 16A.
DALI interface with two independent
addresses.
Mounting on DIN rail.
Weight 0.21kg



82950.000

Mounting plate for panelled ceilings
Metal, white (RAL9002) powder-coated.
Individual design of mounting plates
according to ceiling type and luminaire.
Quote ceiling type and dimensions.



83980.000

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

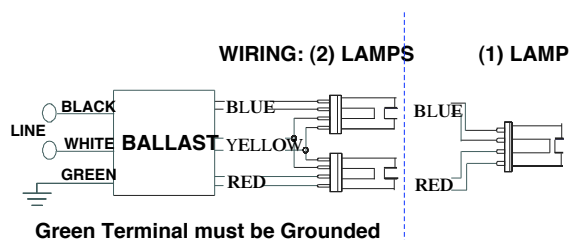
ICF-2S42-M2-BS@277

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

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (ANSI Watts)	Ballast Factor	MAX THD %	Power Factor	MAX Lamp Current Crest Factor	B.E.F .
* CFM32W/GX24q	2	32	0/-18	0.25	68	0.98	10	0.98	1.5	1.44

Wiring Diagram

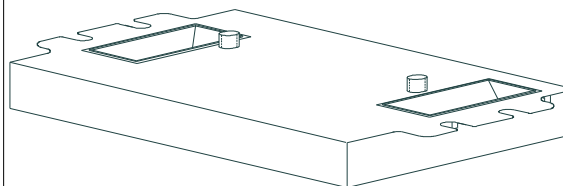


The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

	in.	cm.		in.	cm.
Black	0.0		Yellow/Blue		
White	0.0		Blue/White		
Blue	0.0		Brown		
Red	0.0		Orange		
Yellow	0		Orange/Black		
Gray			Black/White		
Violet			Red/White		

Enclosure



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 02/12/2008



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

PHILIPS LIGHTING ELECTRONICS N.A.

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

ICF-2S42-M2-BS@277

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

Electrical Specifications

Notes:

Section I - Physical Characteristics

- 1.1 Ballast shall be physically interchangeable with standard electromagnetic or standard electronic ballasts, where applicable.
- 1.2 Ballast shall be available in a plastic/metal can or all metal can construction to meet all plenum requirements.
- 1.3 Ballast shall be provided with poke-in wire trap connectors color coded per ANSI C82.11.

Section II - Performance Requirements

- 2.1 Ballast shall be Programmed Start except for ballasts with -QS suffix, which shall be Rapid Start.
- 2.2 Ballast shall contain auto restart circuitry in order to restart lamps without resetting power.
- 2.3 Ballast shall operate from 50/60 Hz input source of 120V through 277V with sustained variations of +/- 10% (voltage and frequency) with no damage to the IntelliVolt ballast. RCF models shall operate from 60 Hz input source of 120V with sustained variations of +/- 10% (voltage and frequency) with no damage to the ballast.
- 2.4 Ballast shall be high frequency electronic type and operate lamps at a frequency above 42 kHz to avoid interference with infrared devices and eliminate visible flicker.
- 2.5 Ballast shall have a Power Factor greater than 0.98 for primary lamp.
- 2.6 Ballast shall have a minimum ballast factor of 1.00 for primary lamp application.
- 2.7 Ballast shall provide for a Lamp Current Crest Factor of 1.7 or less in accordance with lamp manufacturer recommendations.
- 2.8 Ballast input current shall have Total Harmonic Distortion (THD) of less than 10% when operated at nominal line voltage with primary lamp.
- 2.9 Ballast shall have a Class A sound rating.
- 2.10 Ballast shall have a minimum starting temperature of -18C (0F) for primary lamp. Ballasts for PL-H lamps shall have a minimum starting temperature of -30C (-20F) for primary lamp.
- 2.11 Ballast shall provide Lamp EOL Protection Circuit.
- 2.12 Ballast shall tolerate sustained open circuit and short circuit output conditions without damage.

Section III - Regulatory Requirements

- 3.1 Ballast shall not contain any Polychlorinated Biphenyl (PCB).
- 3.2 Ballast shall be Underwriters Laboratories (UL) listed, Class P and Type 1 Outdoor; and Canadian Standards Association (CSA) certified where applicable.
- 3.3 Ballast shall be rated for use in air-handling spaces.
- 3.4 Ballast shall comply with ANSI C62.41 Category A for Transient protection.
- 3.5 Ballast shall comply with ANSI C82.11 where applicable.
- 3.6 Ballast shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 18, Non-Consumer (Class A) for EMI/RFI (conducted and radiated).

Section IV - Other

- 4.1 Ballast shall be manufactured in a factory certified to ISO 9002 Quality System Standards.
- 4.2 Ballast shall carry a five-year warranty from date of manufacture against defects in material or workmanship, including replacement, for operation at a maximum case temperature of 75C and three-years for a maximum case temperature of 85C (90C 3year warranty for ICF1H120-M4-XX, ICF2S42-90C-M2-XX and ICF2S70-M4-XX models).
- 4.3 Manufacturer shall have a fifteen-year history of producing electronic ballasts for the North American market.

Revised 02/12/2008



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

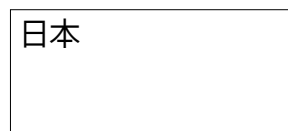
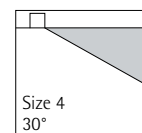
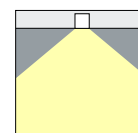
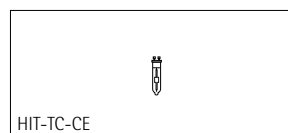
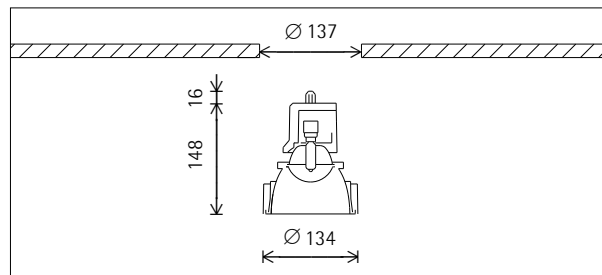
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for metal halide lamps



47406.000 Reflector silver
 HIT-TC-CE 20W GU6.5 1615lm
 HIT-TC-CE 35W GU6.5 3400lm
 Flush mounting detail

Product description

Lampholder carrier: cast aluminium, designed as heat sink. Fixing ring: plastic, black.

Mounting ring: plastic, white (RAL9002). Mounting for ceiling thicknesses of 1-25mm with covered mounting detail and 12.5-25mm with flush mounting detail.

Cable with plug, L 500mm.

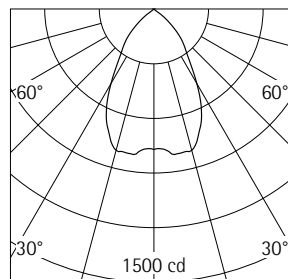
Spherolit technology upper reflector: aluminium, silver, mirror-finish anodised.

Darklight reflector: aluminium, bright anodised. Cut-off angle 30°.

Narrow diffuser: glass, frosted.

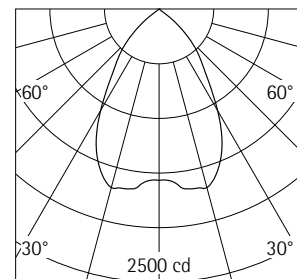
Control gear to be ordered separately.

Weight 0.55kg



HIT-TC-CE 20W GU6.5 1615lm

LOR 0.59
 UGR 19.1
 65° < 200 cd/m²



HIT-TC-CE 35W GU6.5 3400lm

LOR 0.62
 UGR 22.0
 65° < 1000 cd/m²

Planning data

47406.000 HIT-TC-CE 20W GU6.5 1615lm
 Connected load without control gear P: 20 W
 Connected load per 100lx P*: 2.0 W/m²
 Number of luminaires per 100lx n*: 10.1 1/100m²

47406.000 HIT-TC-CE 35W GU6.5 3400lm
 Connected load without control gear P: 35 W
 Connected load per 100lx P*: 1.6 W/m²
 Number of luminaires per 100lx n*: 4.6 1/100m²

47406.000 HIT-TC-CE 20W GU6.5 1615lm
 Number of luminaires per 100m² for
 100lx 200lx 300lx 500lx
 11 21 31 51

47406.000 HIT-TC-CE 35W GU6.5 3400lm
 Number of luminaires per 100m² for
 100lx 200lx 300lx 500lx
 5 10 14 23

47406.000 HIT-TC-CE 20W GU6.5 1615lm
 Module (m) 1.2x1.8 1.8x1.8 1.8x2.4 2.4x2.4
 Illuminance E_n (lx) 460 307 230 173

47406.000 HIT-TC-CE 35W GU6.5 3400lm
 Module (m) 1.2x1.8 1.8x1.8 1.8x2.4 2.4x2.4
 Illuminance E_n (lx) 1013 675 506 380

Correction table

Ceiling	0.70	0.70	0.70	0.50	0
Wall	0.70	0.50	0.20	0.20	0
Floor	0.50	0.20	0.20	0.10	0

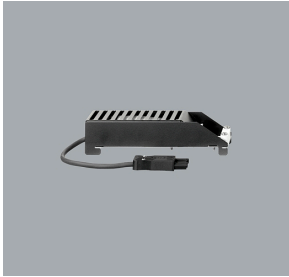
k	0.6	84	67	59	58	56
k	1.0	104	82	75	73	70
k	1.5	117	93	87	84	81
k	2.5	128	100	96	91	87
k	3.0	132	103	99	93	90

Cleaning (a)	1					2					3				
Ambient conditions	P	C	N	D	P	C	N	D	P	C	N	D			
LMF	0.94	0.88	0.82	0.77	0.91	0.83	0.77	0.71	0.89	0.79	0.73	0.65			
RSMF	0.96	0.92	0.87	0.81	0.96	0.92	0.87	0.81	0.96	0.92	0.87	0.81			

Hours of operation (h)	1000	2000	4000	6000	8000	9000
LLMF	0.94	0.86	0.82	0.75	0.69	0.66
LSF	1	1	1	1	1	1

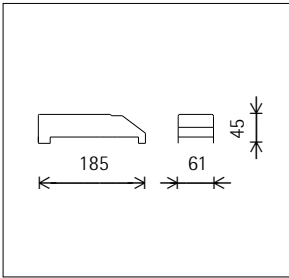
MF LMFxRSMFxLLMFxLSF
 MF Maintenance Factor
 LMF Luminaire Maintenance Factor
 RSMF Room Surface Maintenance Factor
 LLMF Lamp Lumens Maintenance Factor
 LSF Lamp Survival Factor
 P Room pure
 C Room clean
 N Room normal
 D Room dirty

Accessories



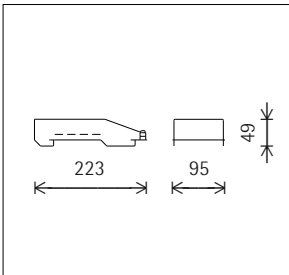
83669.000

Control gear
for HIT-TC-CE 20W, G8.5 and GU6.5 and
HIT-CE 20W, G12 and HIPAR51-CE-P
20W, GX10.
Metal, black powder-coated.
Electronic control gear 220-240V, 50-
60Hz. Strain relief. Through-wiring pos-
sible. 5-pole terminal block. Luminaire
connection cable with plug connection,
L 200mm.
Weight 0.36kg



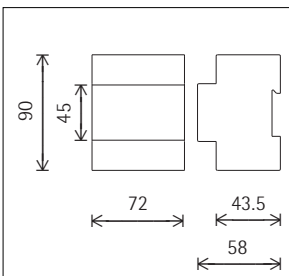
83655.000

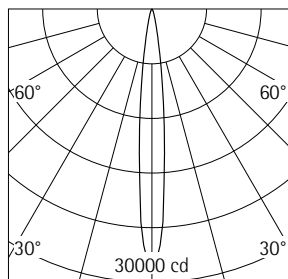
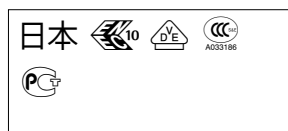
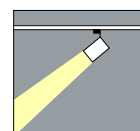
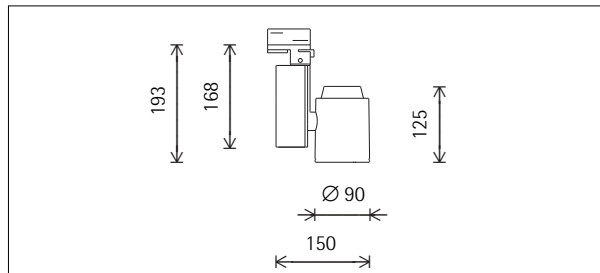
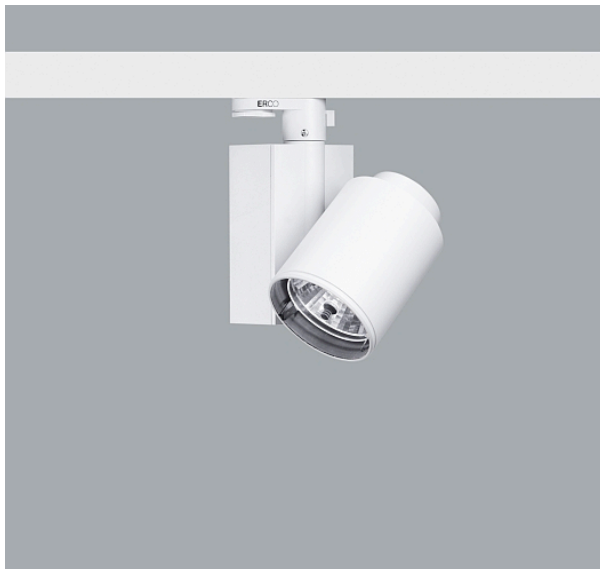
Control gear
for HIT-TC-CE 35W, GU6.5 and HIT-CE
35W, G12.
Metal, black powder-coated.
Electronic control gear 220-240V, 50-
60Hz. 5-pole terminal block. Strain
relief. Through-wiring possible. Con-
nection cable with plug, L 200mm.
Weight 0.65kg



83816.000

DALI switch actuator, double, 16A
Two voltage-free contacts for switching
ohmic, inductive and capacitive loads
max 16A.
DALI interface with two independent
addresses.
Mounting on DIN rail.
Weight 0.21kg





HIT-TC-CE 35W G8.5 3500lm

h(m)	E(lx)	D(m)
		11°
1	28576	0.19
2	7144	0.39
3	3175	0.58
4	1786	0.77
5	1143	0.96

72030.000 White (RAL9002)
HIT-TC-CE 35W G8.5 3500lm
ECG
Spherulit reflector, narrow spot

Product description

Cylindrical light head: cast aluminium, powder-coated. 180° tilt. Peripheral groove for fixing accessories.
Housing: plastic, rotatable on 3-circuit adapter through 360°.
Electronic control gear.
ERCO 3-circuit adapter: plastic.
Reflector: aluminium, silver, mirror-finish anodised. Safety glass.
Weight 0.80kg



Mounting

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

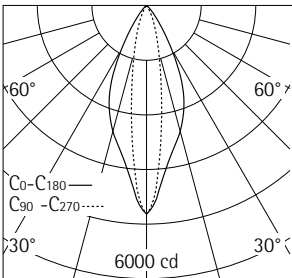
Planning data

Cleaning (a)	1				2				3			
Ambient conditions	P	C	N	D	P	C	N	D	P	C	N	D
LMF	0.94	0.88	0.82	0.77	0.91	0.83	0.77	0.71	0.89	0.79	0.73	0.65
RSMF	0.96	0.92	0.87	0.81	0.96	0.92	0.87	0.81	0.96	0.92	0.87	0.81
Hours of operation (h)	1000	2000	4000	6000	8000	10000	12000					
LLMF	1.00	0.95	0.90	0.87	0.85	0.83	0.80					
LSF	1	1	1	1	1	1	1					
MF	LMFxRSMFxLLMFxLSF											
MF	Maintainance Factor											
LMF	Lumiaire Maintenance Factor											
RSMF	Room Surface Maintenance Factor											
LLMF	Lamp Lumens Maintenance Factor											
LSF	Lamp Survival Factor											
P	Room pure											
C	Room clean											
N	Room normal											
D	Room dirty											

Accessories



74420.000
Sculpture lens
Only in conjunction with:
75801.000



HIT-TC-CE 35W G8.5 3500lm

h(m)	E(lx)	D(m)	
		C0	C90
		42°	17°
1	4580	0.77	0.30
2	1145	1.54	0.60
3	509	2.30	0.90
4	286	3.07	1.20
5	183	3.84	1.49



74447.000
Interference colour filter
Magenta
Only in conjunction with:
75801.000



74448.000
Interference colour filter
Amber
Only in conjunction with:
75801.000



74406.000
UV filter
Only in conjunction with:
75801.000



74449.000
Interference colour filter
Sky blue
Only in conjunction with:
75801.000



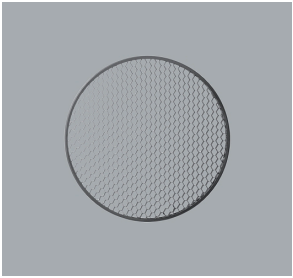
74405.000
IR filter
Only in conjunction with:
75801.000



74450.000
Interference colour filter
Night blue
Only in conjunction with:
75801.000



74484.000
Skintone filter
Only in conjunction with:
75801.000



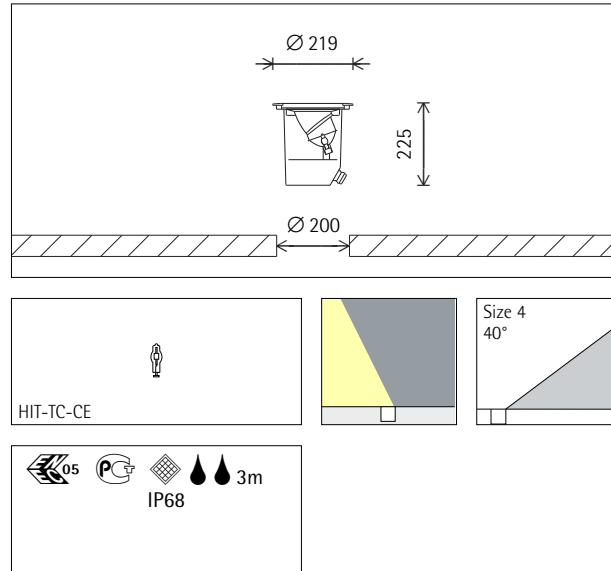
74430.000
Honeycomb anti-dazzle screen
Metal, black.
Only in conjunction with:
75801.000



74485.000
Daylight conversion filter
Only in conjunction with:
75801.000



75801.000
Mounting ring
White
Plastic.



33704.000 Reflector silver
HIT-TC-CE 20W PGJ5 1650lm
ECG

Product description

Housing: corrosion-resistant cast aluminium, No-Rinse surface treatment. Black double powder-coated. Lampholder carrier, 360° rotation. Mounting by means of a swing bolt. Clamp extension 5-40mm.

Electronic control gear. Cable 3x1.5mm², L 1m.

Wallwasher reflector: aluminium, silver anodised.

Darklight reflector: aluminium, silver, bright anodised, with wallwasher lens. Cut-off angle 40°.

Screw-fastened cover ring with flush safety glass: corrosion resistant stainless steel. Safety glass: 12mm, clear. Can be driven over by vehicles with pneumatic tyres. Load 45kN.

Installation with separate connection sleeve.

Protection mode IP68 3m: protection against dust ingress, and continuous immersion up to 3m deep.

On site protection must be provided using a residual current circuit breaker, FI≤30mA.

Weight 3.10kg

Temperature on the light aperture 55°C

Planning data

Illuminance E_n (lx)

Specifications:

Number of luminaires $n > 5$

Wall height (m) 3

HIT-TC-CE 20W PGJ5 1650lm

Offset from wall (m)	1.00		1.00		1.25		1.25	
Luminaire spacing (m)	1.00		1.25		1.25		1.50	
	below the luminaire	between the luminaires	below the luminaire	between the luminaires	below the luminaire	between the luminaires	below the luminaire	between the luminaires
2.750	114	113	94	92	96	95	81	80
2.500	131	129	107	105	101	100	86	84
2.250	147	145	120	117	103	102	87	85
2.000	158	156	129	125	101	100	86	82
1.750	161	159	132	126	94	93	81	76
1.500	153	152	127	119	85	83	73	66
1.250	137	134	115	102	73	70	63	56
1.000	114	109	96	83	61	59	52	47
0.750	91	87	76	67	47	45	41	35
0.500	55	48	50	32	19	14	18	10
0.250	3	2	3	1	0	0	0	0

Cleaning (a)	1				2				3			
Ambient conditions	P	C	N	D	P	C	N	D	P	C	N	D
LMF	0.96	0.94	0.90	0.86	0.93	0.91	0.86	0.81	0.92	0.90	0.84	0.79
RSMF	0.91	0.83	0.68	0.51	0.90	0.81	0.67	0.50	0.90	0.81	0.67	0.50

Hours of operation (h)	1000	2000	4000	6000	8000	9000
LLMF	0.94	0.86	0.82	0.75	0.69	0.66
LSF	1	1	1	1	1	1

MF	LMFxRSMFxLLMFxLSF
MF	Maintainance Factor
LMF	Luminaire Maintenance Factor
RSMF	Room Surface Maintenance Factor
LLMF	Lamp Lumens Maintenance Factor
LSF	Lamp Survival Factor
P	Room pure
C	Room clean
N	Room normal
D	Room dirty

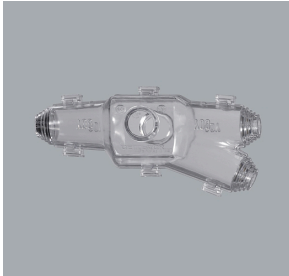
Accessories



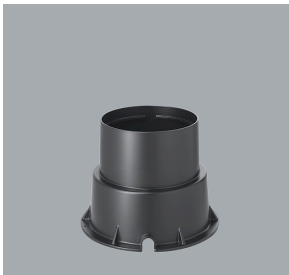
34974.000
Distribution box, IP68
With four cable entries, 7-25mm.
Plastic.
ø 95mm, L 240mm.
Weight 0.47kg
◆ 3m
IP68



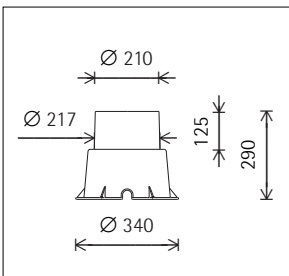
33958.000
Coupling sleeve
for max. 16mm cable diameter.
Plastic conduit, two-part PUR-cast resin.
ø 26mm, L 180mm.

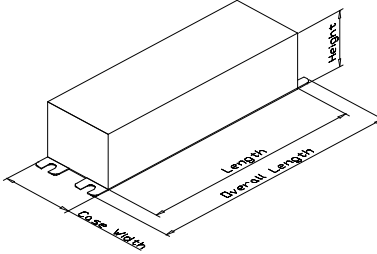
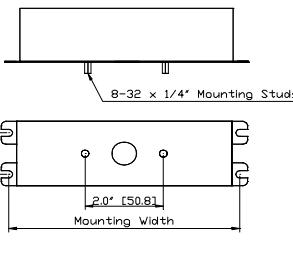
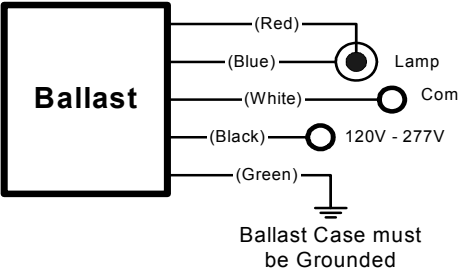
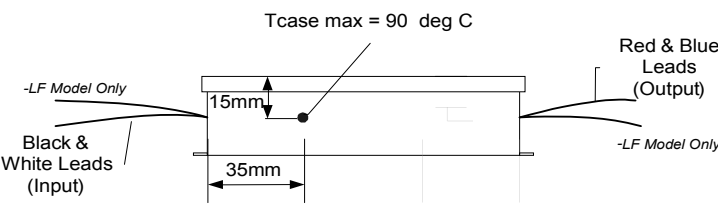


33959.000
Branching sleeve
for 8-23mm cable diameter.
Plastic shell, two-part PUR cast resin.
L 150mm, B 70mm, H 46mm.



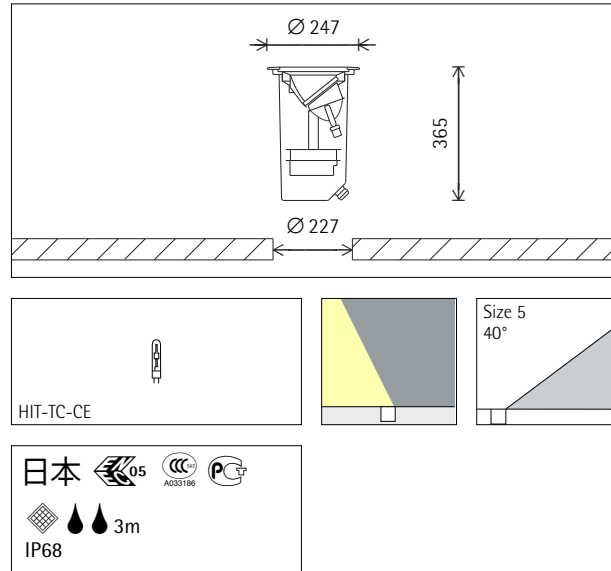
33734.000
Housing for recessed mounting
Corrosion-resistant cast aluminium, No-Rinse surface treatment. Black double powder-coated. 2 cable entries.
Weight 2.90kg



PHILIPS ADVANCE				e-Vision® Electronic Ballast for Metal Halide Lamps			Catalog Number: IMH-G20-E For 20W Metal Halide Lamps ANSI M156 120-277V 50/60Hz Electronic Status: PRELIMINARY			
DIMENSIONS AND DATA										
Lamp		Input Volts	Catalog Number*	Line Current (Amps)	Input Power (Watts)	Min Power Factor	Wiring Diag	Fig.	Weight (lb)	Max. Distance to Lamp (ft)
Number	Watts									
20W Watt Lamp, ANSI Code M156 Minimum Starting Temp -20°C/-4°F										
1	20	120 277	IMH-G20-E-XXX	0.21 0.09	24 24	0.9	3	E	0.55	5
										
										
Wiring Diagram 3										
Case Figure	Overall Length	Case Length	Case Width	Height	Mountin Length	Mounting Width				
E	140mm [5.5"]	127mm [5.0"]	44mm [1.7"]	30mm [1.2"]	135mm [5.3"]	26mm [1.0"]				
										
Case Temperature Measurement Location										
INSTALLATION & APPLICATION NOTES:							*Ordering Information			
1. Maximum allowable case temperature is 90°C. See figure above for measurement location							Order Suffix			
2. Ignition pulse is 4 kV max							Description			
3. All leads are 12 inches long										
4. Ballast output will shutdown after 20 minutes if lamp fails to ignite							-LF			
5. Power must be cycled off – then on, after replacing lamp										
Data is based on tests performed by Philips Advance in a controlled environment and is representative of relative performance. Actual performance can vary depending on operating conditions. Specifications are subject to change without notice. All specifications are nominal unless otherwise noted.										

Philips Lighting Electronics N.A.

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



33715.000 Reflector silver
HIT-TC-CE 35W G8.5 3500lm
ECG

Product description

Housing: corrosion-resistant cast aluminium, No-Rinse surface treatment. Black double powder-coated. Lampholder carrier, 360° rotation. Mounting by means of a swing bolt. Clamp extension 5-40mm.
Cable 3x1.5mm², L 1m.
Electronic control gear.
Wallwasher reflector: Aluminium, silver anodised.
Darklight reflector: aluminium, silver, bright anodised, with wallwasher lens. Cut-off angle 40°.
Screw-fastened cover ring with flush safety glass: corrosion resistant stainless steel. Safety glass: 12mm, clear. Can be driven over by vehicles with pneumatic tyres. Load 45kN. Installation with separate connection sleeve.
Protection mode IP68 3m: protection against dust ingress, and continuous immersion up to 3m deep. On site protection must be provided using a residual current circuit breaker, FI≤30mA.
Weight 6.30kg
Temperature on the light aperture 65°C

Planning data

Illuminance E_n (lx)

Specifications:

Number of luminaires $n > 5$

Wall height (m) 4

HIT-TC-CE 35W G8.5 3500lm

Offset from wall (m)	1.25			1.25			1.50			1.50		
Luminaire spacing (m)	1.25			1.50			1.50			1.75		
	below the luminaire	between the luminaires		below the luminaire	between the luminaires		below the luminaire	between the luminaires		below the luminaire	between the luminaires	
3.500	132	131		111	111		129	129		111	112	
3.000	178	176		149	150		160	160		138	138	
2.500	231	231		193	194		187	186		163	158	
2.000	275	273		235	223		195	185		175	153	
1.500	268	244		238	190		149	129		136	104	
1.000	136	120		122	92		60	55		55	43	
0.500	20	16		19	11		7	6		7	4	

Cleaning (a)	1				2				3			
Ambient conditions	P	C	N	D	P	C	N	D	P	C	N	D
LMF	0.96	0.94	0.90	0.86	0.93	0.91	0.86	0.81	0.92	0.90	0.84	0.79
RSMF	0.91	0.83	0.68	0.51	0.90	0.81	0.67	0.50	0.90	0.81	0.67	0.50

Hours of operation (h)	1000	2000	4000	6000	8000	10000	12000
LLMF	1.00	0.95	0.90	0.87	0.85	0.83	0.80
LSF	1	1	1	1	1	1	1

MF	LMFxRSMFxLLMFxLSF
MF	Maintainance Factor
LMF	Luminaire Maintenance Factor
RSMF	Room Surface Maintenance Factor
LLMF	Lamp Lumens Maintenance Factor
LSF	Lamp Survival Factor
P	Room pure
C	Room clean
N	Room normal
D	Room dirty

Accessories



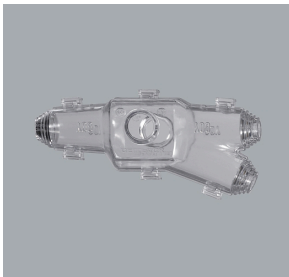
33950.000
Domed glass
To prevent accumulation of dirt.
Load: 5kN.
Cannot be driven over by vehicles.



34974.000
Distribution box, IP68
With four cable entries, 7-25mm.
Plastic.
ø 95mm, L 240mm.
Weight 0.47kg
◆ 3m
IP68



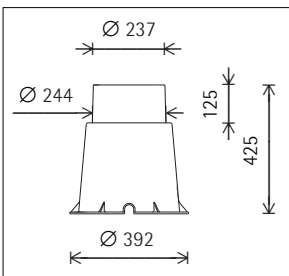
33958.000
Coupling sleeve
for max. 16mm cable diameter.
Plastic conduit, two-part PUR-cast resin.
ø 26mm, L 180mm.

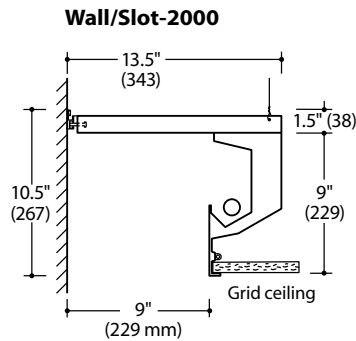


33959.000
Branching sleeve
for 8-23mm cable diameter.
Plastic shell, two-part PUR cast resin.
L 150mm, B 70mm, H 46mm.



33962.000
Housing for recessed mounting
Corrosion-resistant cast aluminium, No-Rinse surface treatment. Black double powder-coated. 2 cable entries.
Weight 5.80kg





Wall/Slot®-2000



Wall/Slot®-2000PR

2000 or 2000PR
Recessed Perimeter

Product Description

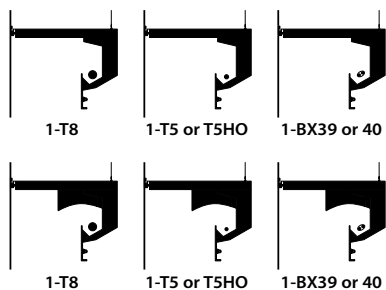
The patented Wall/Slot-2000 is a steel recessed perimeter fixture that fully conceals the lamp from view. This fixture creates a "floating ceiling" effect washing the wall with light at the junction of the ceiling and wall. This fixture is Cradle to Cradle Certified™ Silver by MBDC.

Ordering Guide

Product, Lamping, & Length				Options			
20	1	4	T8	CWM -	ELB10	PR	120
Series	Lamp Count	Nominal Length (ft)	Lamp Type	Finish	Ballast	Other Options	Volts
20	1 →	2, 3, 4	T8	CWM (Matte White) is standard	ELB10 is standard for T8 or BX LP/ELB is standard for T5 or T5HO DA/MK7 DO/HEL DL/ECO see Ballast Options	EF F PR see Other Options notes: Lamp Count = total number of lamps in the fixture For Ordering guide information in shaded areas, choose selection by reading ACROSS the shaded areas for correct specifications.	120 277
	2 →	6, 8					
	1 →	2, 3, 4	T5HO				
	2 →	6, 8	T5				
	1 →	2	BX40				
	2 →	4					
	4 →	8					
	2 →	3	BX39				
	4 →	6					
	see notes						

2014T8-CWM-ELB10-PR-120 is a typical catalog number for a 1-lamp (1 lamp in cross-section), 4-foot long T8 fixture with Matte White finish, electronic ballast, parabolic reflector, 120 volts.

Cross-section lamping



Ballast Options

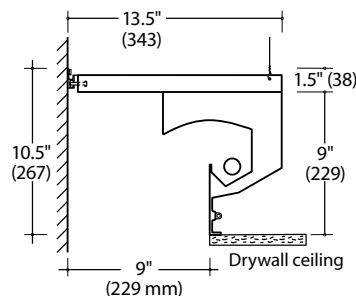
Specify in place of **ELB** or **LP/ELB**, contact factory for availability:

DA/MK7 Advance Mark VII Dimming Ballast.
DO/HEL Osram Sylvania Helios Dimming Ballast.
DL/ECO Lutron ECO-10 Dimming Ballast.

Other Options

EF Emergency Fluorescent Ballast. Battery-powered ballast from a UL Listed manufacturer will operate one T8 lamp for 1 1/2 hours.
F Fuse installed. Slow or fast blow, determined by Litecontrol.
PR Parabolic Reflector. Larger specular hammertone aluminum reflector for additional downward light projection.

Wall/Slot-2000 PR



Questions to Ask

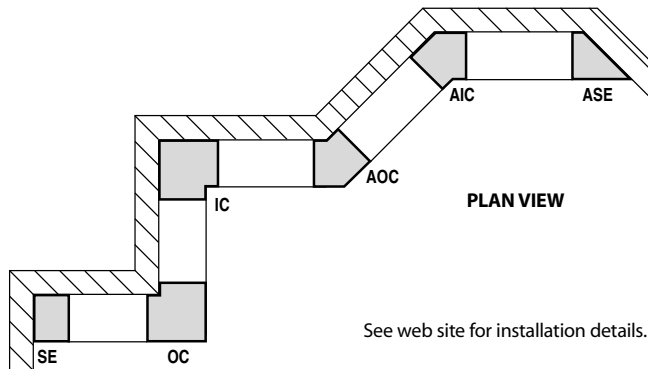
1. Row information, including desired fixture lengths?
2. Lamp type? 3. Ballast options? 4. Controls solutions?
5. Other options? 6. 120 or 277 volt?

System Connectors

Catalog Number			
Series	Connector	Finish	Description (Minimum-Maximum along wall in parenthesis)
2000	EC	CWM	End Cap
2000	SE	CWM	Straight Extension (2"-12")
2000	IC	CWM	Inside Corner - 90° (14"-21")
2000	OC	CWM	Outside Corner - 90° (2"-11")
2000	ASE	CWM	Angular Straight Extension - 135° (2"-11")
2000	AIC	CWM	Angular Inside Corner - 135° (6"-15")
2000	AOC	CWM	Angular Outside Corner - 135° (2"-11")

2000-AOC-CWM is a typical catalog number for an angular outside corner connector. Corners, extensions, and end caps, when added to fixtures, permit continuous wall-to-wall installation. Lengths are field cut.
Finish: CWM (Matte White)

NOTE: Parabolic reflector is positioned above lamps only, and does not extend through system connectors.



Specifications

FIXTURE SUPPORT RAIL. Extruded white aluminum, wall-mounted rail provides continuous support and true alignment of fixtures and components. Rail is designed to provide a reveal at the wall to compensate for irregularities in wall construction. Galvanized splines are included for continuous alignment.

FIXTURE HOUSING. Die-formed and welded steel. Plenum cover/wall bracket is a welded assembly with heavy gauge steel strengthening members. Support chain attachment locations are spaced approximately every two feet for 2, 4, and 8-foot fixtures, and 1 1/2 feet for 3-foot and 6-foot fixtures. Plenum cover has a continuous hook-and-lock feature for quick installation.

REFLECTOR. **2000** curved reflector is die-formed specular hammertone aluminum, precisely shaped for maximum downward light projection. Straight reflector portions are steel, finished in high-reflectance white for uniform light distribution. **2000PR** uses a larger parabolic reflector (**PR**), die-formed, hammertone, low-iridescence semi-specular aluminum, precisely shaped for maximum downward light projection. It is shielded from all viewing angles from 0° to 60° below horizontal. Straight reflector portions are steel, finished in high-reflectance white for uniform light distribution.

CEILING TRIM/LUMINANCE CONTROL DEFLECTOR. Extruded aluminum with internal aligner splines.

LCD shields lamps from direct view and eliminates socket shadows on wall. Paint finish is Matte White (**CWM**) baked enamel.

LAMPING. Available in one-lamp T5, T5HO, or T8, or one-lamp twin-tube compact fluorescent.

BALLAST. Electronic Ballast (**ELB** - for T8 or BX lamping) or Low-profile Electronic Ballast (**LP/ELB** - for T5 or T5HO lamping), high power factor, thermally protected Class P, Sound Rated A, manufactured by a UL Listed manufacturer, as available, determined by Litecontrol. Ballasts with a voltage range of 120 to 277 will be used when fixture configuration and ballast availability allow. The minimum number of ballasts will be used.

CEILING TYPE. Compatible with most types of ceiling systems, including grid and plaster. Fixture system must be installed prior to installation of ceiling. Finish of wall should extend 11" above finished ceiling height. See Wall/Slot-2000 Pre-Installation Manual for specific ceiling type details.

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

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

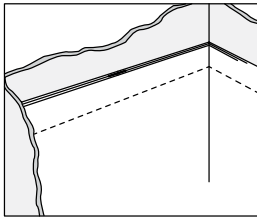
Cradle to Cradle Certified^{CM} is a certification mark of MBDC.

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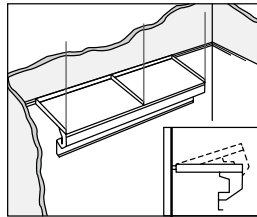
Planning for installation

Finished wall should extend 11" above ceiling. Locate bottom of Fixture Support Rail 9 1/4" up from bottom of ceiling for Lay-in Grid T-bar ceilings. Extruded trim of fixtures supports ceiling tiles at perimeter; elsewhere ceiling construction must be supported independently of the lighting system.

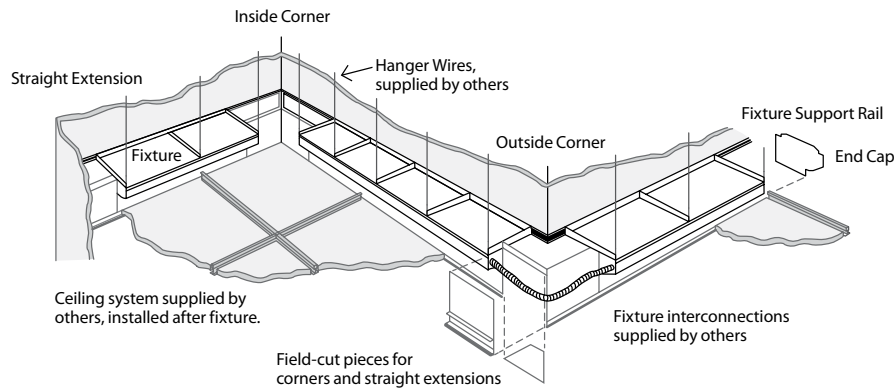
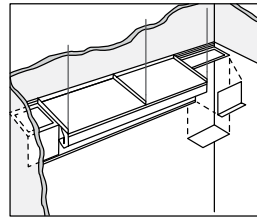
1. Install Fixture Support Rails on wall.



2. Hook fixtures on rail and slide into position. Attach hanger wires.

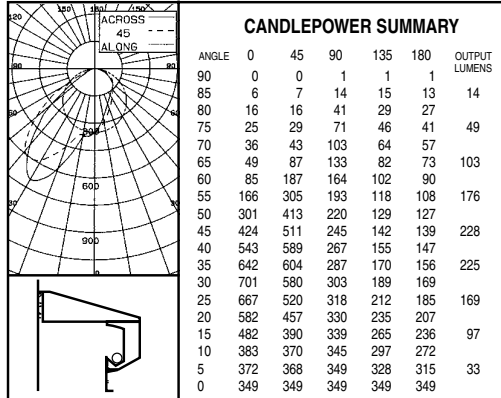


3. Install extensions and corners.



Photometric data

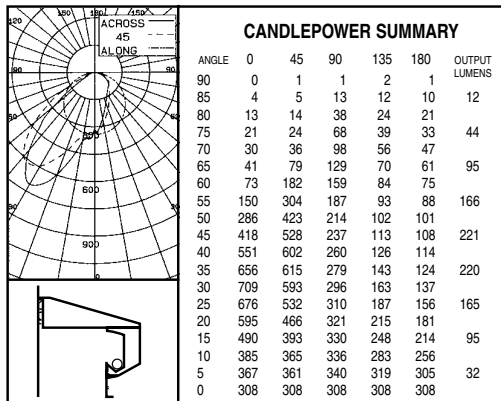
Wall/Slot 2000/PR



2014T8-120 70% wall reflectance Litecontrol Certified Test Report #14711001																					
RCC RW	80				70				50				30				10				
	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10				
RCR	0	.45	.45	.45	.45	.44	.44	.44	.44	.42	.42	.42	.40	.40	.40	.38	.38	.38	.38	.38	
1	.42	.40	.39	.37	.41	.39	.38	.37	.38	.37	.36	.36	.35	.35	.35	.34	.34	.33	.33	.33	
2	.38	.36	.33	.31	.37	.35	.33	.31	.33	.32	.30	.32	.31	.30	.31	.30	.29	.28	.28	.28	
3	.35	.32	.29	.27	.34	.31	.29	.27	.30	.28	.26	.29	.27	.26	.28	.27	.25	.24	.24	.24	
4	.32	.28	.25	.23	.32	.28	.25	.23	.27	.24	.22	.26	.24	.22	.25	.23	.22	.21	.21	.21	
5	.30	.25	.22	.19	.29	.25	.22	.19	.24	.21	.19	.23	.21	.19	.22	.20	.19	.18	.18	.18	
6	.27	.22	.19	.17	.27	.22	.19	.17	.21	.19	.17	.21	.18	.17	.20	.18	.16	.16	.16	.16	
7	.25	.20	.17	.15	.24	.20	.17	.15	.19	.16	.15	.19	.16	.14	.18	.16	.14	.14	.14	.14	
8	.23	.18	.15	.13	.22	.18	.15	.13	.17	.14	.12	.17	.14	.12	.16	.14	.12	.12	.12	.12	
9	.21	.16	.13	.11	.21	.16	.13	.11	.15	.13	.11	.15	.12	.11	.15	.12	.10	.10	.10	.10	
10	.19	.15	.11	.09	.19	.14	.11	.09	.14	.11	.09	.14	.11	.09	.13	.11	.09	.09	.09	.09	
Floor Cavity Reflectance .20																					

ZONAL LUMEN SUMMARY			
ZONE	LUMENS	% LAMP	% LUMINAIRE
180-90°	0	0.0	0.0
90-0°	1090	37.61	100
180-0°	1090	37.61	100

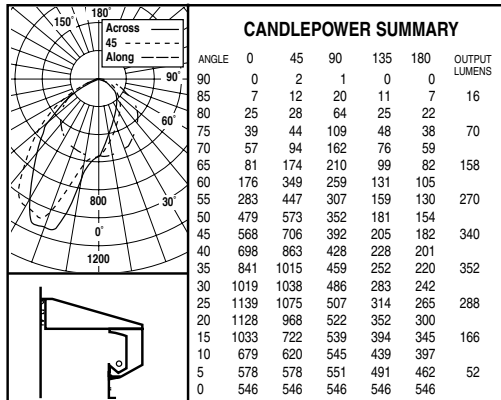
LUMINANCE SUMMARY (fL)					
ANGLE	0°	45°	90°	135°	180°
45°	630	759	362	210	206
55°	304	559	353	216	198
65°	123	216	330	205	183
75°	103	118	289	186	167
85°	69	80	174	181	151



2014T8-120 50% wall reflectance Litecontrol Certified Test Report #14711000																					
RCC RW	80				70				50				30				10				0
	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10				
RCR																					
0	.43	.43	.43	.43	.42	.42	.42	.42	.40	.40	.40	.38	.38	.38	.37	.37	.37	.36	.36	.36	
1	.40	.38	.37	.36	.39	.38	.36	.35	.36	.35	.34	.35	.34	.33	.33	.33	.32	.32	.32	.32	
2	.37	.34	.32	.30	.36	.34	.32	.30	.32	.31	.29	.31	.30	.29	.30	.29	.28	.27	.27	.27	
3	.34	.30	.28	.26	.33	.30	.28	.26	.29	.27	.25	.28	.26	.25	.27	.26	.24	.24	.24	.24	
4	.31	.27	.24	.22	.30	.27	.24	.22	.26	.24	.22	.25	.23	.21	.24	.23	.21	.20	.20	.20	
5	.29	.24	.21	.19	.28	.24	.21	.19	.23	.21	.19	.22	.20	.18	.22	.20	.18	.18	.18	.18	
6	.26	.22	.19	.16	.26	.21	.18	.16	.21	.18	.16	.20	.18	.16	.20	.17	.16	.15	.15	.15	
7	.24	.19	.16	.14	.24	.19	.16	.14	.19	.16	.14	.18	.16	.14	.18	.15	.14	.13	.13	.13	
8	.22	.17	.14	.12	.22	.17	.14	.12	.17	.14	.12	.16	.14	.12	.16	.14	.12	.11	.11	.11	
9	.20	.16	.13	.10	.20	.15	.12	.10	.15	.12	.10	.14	.12	.10	.14	.12	.10	.10	.10	.10	
10	.19	.14	.11	.09	.18	.14	.11	.09	.13	.11	.09	.13	.11	.09	.13	.11	.09	.08	.08	.08	
Floor Cavity Reflectance .20																					

ZONAL LUMEN SUMMARY			
ZONE	LUMENS	% LAMP	% LUMINAIRE
180-90°	0	0.0	0.0
90-0°	1045	36.05	100
180-0°	1045	36.05	100

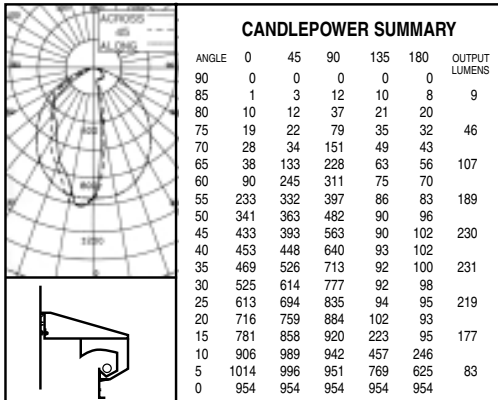
LUMINANCE SUMMARY (fL)					
ANGLE	0°	45°	90°	135°	180°
45°	622	785	351	167	160
55°	275	558	342	171	162
65°	102	196	319	174	151
75°	83	97	274	160	135
85°	51	61	160	144	126



2014T5HO 50% wall reflectance Litecontrol Certified Test Report #14716000																					
RCC RW	80				70				50				30				10				0
	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	50	30	10	
RCR																					
0	.41	.41	.41	.41	.40	.40	.40	.40	.38	.38	.38	.36	.36	.36	.35	.35	.35	.34	.34	.34	
1	.38	.36	.35	.34	.37	.36	.35	.34	.34	.33	.32	.33	.32	.31	.32	.31	.31	.30	.30	.30	
2	.35	.32	.30	.29	.34	.32	.30	.28	.31	.29	.28	.30	.28	.27	.29	.28	.27	.26	.26	.26	
3	.32	.29	.27	.25	.31	.28	.26	.24	.27	.26	.24	.27	.25	.24	.26	.24	.23	.22	.22	.22	
4	.30	.26	.23	.21	.29	.25	.23	.21	.25	.22	.21	.24	.22	.20	.23	.22	.20	.20	.20	.20	
5	.27	.23	.20	.18	.26	.23	.20	.18	.22	.20	.18	.21	.19	.18	.21	.19	.17	.17	.17	.17	
6	.25	.21	.18	.16	.24	.20	.18	.16	.20	.17	.16	.19	.17	.15	.19	.17	.15	.15	.15	.15	
7	.23	.19	.16	.14	.22	.18	.16	.14	.18	.15	.14	.17	.15	.13	.17	.15	.13	.13	.13	.13	
8	.21	.17	.14	.12	.21	.16	.14	.12	.16	.13	.12	.16	.13	.12	.15	.13	.12	.11	.11	.11	
9	.19	.15	.12	.10	.19	.15	.12	.10	.14	.12	.10	.14	.12	.10	.14	.11	.10	.09	.09	.09	
10	.18	.13	.11	.09	.18	.13	.11	.09	.13	.11	.09	.13	.10	.09	.12	.10	.09	.08	.08	.08	
Floor Cavity Reflectance .20																					

Photometric data PR reflector

Wall/Slot 2000/PR



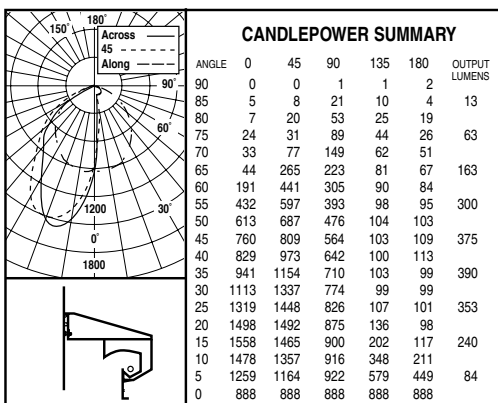
2014T8-PR 70% wall reflectance																					
Litecontrol Certified Test Report #24311001																					
RCC	80				70				50				30				10				0
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	50	30	10	0
RCR																					
0	.53	.53	.53	.53	.52	.52	.52	.52	.49	.49	.49	.47	.47	.47	.45	.45	.45	.44			
1	.49	.48	.46	.45	.48	.47	.45	.44	.45	.44	.43	.43	.42	.41	.42	.41	.40	.39			
2	.46	.43	.40	.38	.45	.42	.40	.38	.40	.39	.37	.39	.38	.36	.38	.37	.35	.35			
3	.42	.39	.36	.33	.41	.38	.35	.33	.37	.34	.32	.36	.34	.32	.34	.33	.31	.30			
4	.39	.35	.32	.29	.38	.34	.31	.29	.33	.31	.28	.32	.30	.28	.31	.29	.28	.27			
5	.36	.31	.28	.25	.35	.31	.27	.25	.30	.27	.25	.29	.27	.25	.28	.26	.24	.23			
6	.34	.28	.25	.22	.33	.28	.25	.22	.27	.24	.22	.27	.24	.22	.26	.23	.22	.21			
7	.31	.26	.22	.20	.31	.25	.22	.20	.25	.22	.20	.24	.21	.19	.24	.21	.19	.19			
8	.29	.23	.20	.18	.28	.23	.20	.17	.23	.20	.17	.22	.19	.17	.22	.19	.17	.16			
9	.27	.21	.18	.16	.26	.21	.18	.16	.21	.18	.15	.20	.17	.15	.20	.17	.15	.14			
10	.25	.20	.16	.14	.25	.19	.16	.14	.19	.16	.14	.18	.16	.14	.18	.16	.14	.13			
Floor Cavity Reflectance .20																					

ZONAL LUMEN SUMMARY

ZONE	LUMENS	% LAMP	% LUMINAIRE
180-90°	0	.00	.00
90-0°	1286	44.35	100
180-0°	1286	44.35	100

LUMINANCE SUMMARY (fL)

ANGLE	0°	45°	90°	135°	180°
45°	644	584	834	134	151
55°	428	608	724	157	151
65°	94	331	564	158	138
75°	76	90	320	140	130
85°	16	38	149	117	101



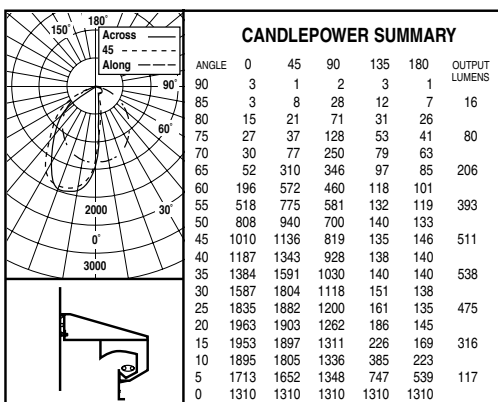
2014T5HO-PR 50% wall reflectance																					
Litecontrol Certified Test Report #24316000																					
RCC	80				70				50				30				10				0
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	50	30	10	0
RCR																					
0	.47	.47	.47	.47	.46	.46	.46	.46	.44	.44	.44	.42	.42	.42	.40	.40	.40	.40	.40	.40	.40
1	.44	.42	.41	.40	.43	.42	.40	.39	.40	.39	.38	.38	.37	.37	.36	.36	.35	.35	.35	.35	.35
2	.41	.38	.36	.34	.40	.37	.35	.34	.36	.34	.33	.35	.33	.32	.34	.32	.31	.31	.31	.31	.31
3	.38	.34	.31	.29	.37	.34	.31	.29	.33	.30	.29	.31	.30	.28	.31	.29	.28	.27	.27	.27	.27
4	.35	.31	.28	.25	.34	.30	.28	.25	.29	.27	.25	.28	.26	.25	.28	.26	.24	.24	.24	.24	.24
5	.32	.28	.24	.22	.31	.27	.24	.22	.26	.24	.22	.26	.23	.21	.25	.23	.21	.20	.20	.20	.20
6	.30	.25	.22	.19	.29	.24	.21	.19	.24	.21	.19	.23	.21	.19	.23	.20	.19	.18	.18	.18	.18
7	.27	.22	.19	.17	.27	.22	.19	.17	.22	.19	.17	.21	.19	.17	.21	.18	.17	.16	.16	.16	.16
8	.25	.20	.17	.15	.25	.20	.17	.15	.19	.17	.15	.19	.16	.15	.19	.16	.15	.14	.14	.14	.14
9	.23	.18	.15	.13	.23	.18	.15	.13	.18	.15	.13	.17	.15	.13	.17	.14	.13	.12	.12	.12	.12
10	.22	.17	.14	.12	.21	.16	.14	.12	.16	.13	.11	.16	.13	.11	.15	.13	.11	.11	.11	.11	.11
Floor Cavity Reflectance .20																					

ZONAL LUMEN SUMMARY

ZONE	LUMENS	% LAMP	% LUMINAIRE
180-90°	0	.00	.00
90-0°	1977	39.55	100.00
180-0°	1977	39.55	100.00

LUMINANCE SUMMARY (fL)

ANGLE	0°	45°	90°	135°	180°
45°	1130	1203	835	152	163
55°	792	1094	717	179	174
65°	109	658	553	200	166
75°	96	126	360	179	107
85°	63	97	249	119	43



2024BX40-PR 50% wall reflectance Litecontrol Certified Test Report #24320000																					
RCC RW	80				70				50				30				10				0
	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	50	30	10	0
RCR																					
0	.50	.50	.50	.50	.49	.49	.49	.49	.47	.47	.47	.45	.45	.45	.43	.43	.43	.42			
1	.47	.45	.44	.43	.46	.44	.43	.42	.42	.41	.41	.41	.40	.39	.39	.39	.38	.37			
2	.43	.41	.39	.37	.43	.40	.38	.36	.39	.37	.35	.37	.36	.35	.36	.35	.34	.33			
3	.40	.37	.34	.32	.39	.36	.34	.31	.35	.33	.31	.34	.32	.30	.33	.31	.30	.29			
4	.37	.33	.30	.28	.37	.33	.30	.28	.32	.29	.27	.31	.29	.27	.30	.28	.27	.26			
5	.35	.30	.27	.24	.34	.30	.27	.24	.29	.26	.24	.28	.26	.24	.27	.25	.24	.23			
6	.32	.27	.24	.22	.31	.27	.24	.22	.26	.23	.21	.25	.23	.21	.25	.23	.21	.20			
7	.30	.25	.21	.19	.29	.24	.21	.19	.24	.21	.19	.23	.20	.19	.23	.20	.18	.18			
8	.28	.22	.19	.17	.27	.22	.19	.17	.22	.19	.17	.21	.19	.17	.21	.18	.17	.16			
9	.26	.20	.17	.15	.25	.20	.17	.15	.20	.17	.15	.19	.17	.15	.19	.16	.15	.14			
10	.24	.19	.16	.13	.23	.18	.16	.13	.18	.15	.13	.18	.15	.13	.17	.15	.13	.13			
Floor Cavity Reflectance .20																					

ZONAL LUMEN SUMMARY

ZONE	LUMENS	% LAMP	% LUMINAIRE
180-90°	0	.00	.00
90-0°	2647	42.02	100.00
180-0°	2647	42.02	100.00

LUMINANCE SUMMARY (fL)

ANGLE	0°	45°	90°	135°	180°
45°	1502	1689	1212	201	218
55	948	1420	1062	242	218
65	130	770	857	242	211
75	108	150	520	216	166
85	34	98	333	142	81

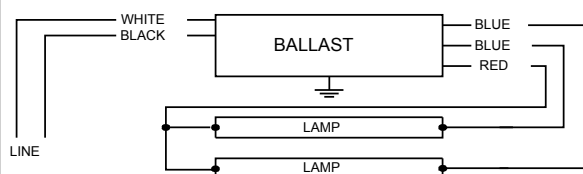
ICN-2P32-N @ 277V

Brand Name	CENTIUM
Ballast Type	Electronic
Starting Method	Instant Start
Lamp Connection	Parallel
Input Voltage	120-277
Input Frequency	50/60 HZ
Status	Active

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (ANSI Watts)	Ballast Factor	MAX THD %	Power Factor	MAX Lamp Current Crest Factor	B.E.F .
* F32T8	1	32	0/-18	0.13	36	1.05	10	0.99	1.6	2.92
F32T8	2	32	0/-18	0.22	56	0.89	10	0.99	1.6	1.59

Wiring Diagram



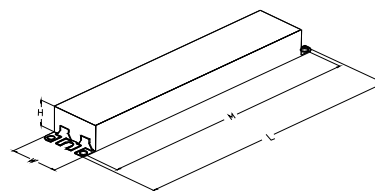
Diag. 64-A

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

Standard Lead Length (inches)

	in.	cm.		in.	cm.
Black	28	71.1	Yellow/Blue		0
White	45	114.3	Blue/White		0
Blue	24	61	Brown		0
Red	24	61	Orange		0
Yellow		0	Orange/Black		0
Gray		0	Black/White		0
Violet		0	Red/White		0

Enclosure



Enclosure Dimensions

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

Revised 04/08/2009



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Customer Support/Technical Service: 800-372-3331 · OEM Support: 866-915-5886

Electrical Specifications

Notes:

Section I - Physical Characteristics

- 1.1 Ballast shall be physically interchangeable with standard electromagnetic or standard electronic ballasts, where applicable.
1.2 Ballast shall be provided with integral leads color-coded per ANSI C82.11.

Section II - Performance Requirements

- 2.1 Ballast shall be _____ (Instant, Rapid or Programmed) Start.
2.2 Ballast shall provide Independent Lamp Operation (ILO) for Instant Start ballasts allowing remaining lamp(s) to maintain full light output when one or more lamps fail.
2.3 Ballast shall contain auto restart circuitry in order to restart lamps without resetting power (except T8/HO and FT5 ballasts).
2.4 Ballast shall operate from 60 Hz input source of 120V, 277V or 347V as applicable with sustained variations of +/- 10% (voltage and frequency) with no damage to the ballast. IntelliVolt models shall operate from 50/60 Hz input source of 120V through 277V with sustained variations of +/- 10% (voltage and frequency) with no damage to the ballast.
2.5 Ballast shall be high frequency electronic type and operate lamps at a frequency above 42 kHz ("GCN" models between 20kHz and 30kHz) to avoid interference with infrared devices and eliminate visible flicker.
2.6 Ballast shall have a Power Factor greater than 0.98 for primary lamp.
2.7 Ballast shall have a minimum ballast factor for primary lamp application as follows: 0.75 for Low Watt, 0.85 for Normal Light Output, and 1.20 for High Light.
2.8 Ballast shall provide for a Lamp Current Crest Factor of 1.7 or less in accordance with lamp manufacturer recommendations.
2.9 Ballast input current shall have Total Harmonic Distortion (THD) of less than 20% for Standard models and THD of less than 10% for Centium models when operated at nominal line voltage with primary lamp.
2.10 Ballast shall have a Class A sound rating for all 4-foot lamps and smaller.
2.11 Ballast shall have a minimum starting temperature of _____ [-18C (0F) for standard T8 and Long Twin Tube lamps, 10C (50F) for standard T12 lamps, 0C (32F) for Slimline T8 lamps and "GCN" models, -29C (-20F) for T8/HO lamps,] for primary lamp application. Ballast shall have a minimum starting temperature of 60F (16C) for energy-saving T8 and T12 lamps.
2.12 Ballast shall tolerate sustained open circuit and short circuit output conditions without damage.

Section III - Regulatory Requirements

- 3.1 Ballast shall not contain any Polychlorinated Biphenyl (PCB).
3.2 Ballast shall be Underwriters Laboratories (UL) listed, Class P and Type 1 Outdoor; and Canadian Standards Association (CSA) certified where applicable. Models with -HAZ suffix meet UL 935 Type HL (hazardous location) requirements.
3.3 Ballast shall comply with ANSI C62.41 Category A for Transient protection.
3.4 Ballast shall comply with ANSI C82.11 where applicable.
3.5 Ballast shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 18, Non-Consumer (Class A) for EMI/RFI (conducted and radiated).

Section IV - Other

- 4.1 Ballast shall be manufactured in a factory certified to ISO 9002 Quality System Standards.
4.2 Ballast shall carry a five-year warranty from date of manufacture against defects in material or workmanship, including replacement, for operation at a maximum case temperature of 70C.
4.3 Manufacturer shall have a fifteen-year history of producing electronic ballasts for the North American market.

NOTE: The use of Optanium (IOP) and ICN-1P32-N, ICN-2P32-N, ICN-3P32-SC, and ICN-4P32-SC models are recommended to reduce striation in energy-saving T8 lamps (25W, 28W or 30W). Remote or tandem wiring of energy-saving T8 lamps (25W, 28W or 30W) is only recommended for Optanium (IOP) models.

Revised 04/08/2009



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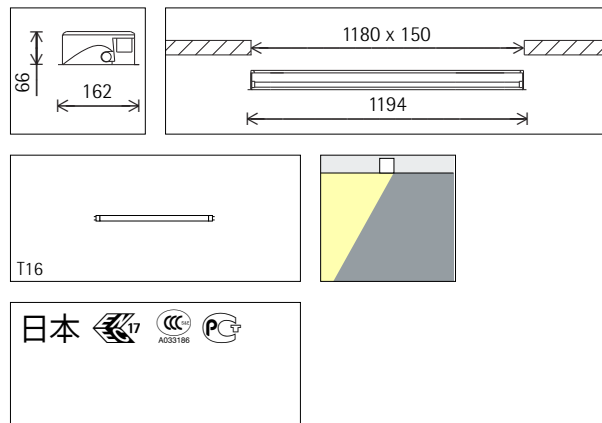
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ICN-2P32-N @ 277V	
Brand Name	CENTIUM
Ballast Type	Electronic
Starting Method	Instant Start
Lamp Connection	Parallel
Input Voltage	120-277
Input Frequency	50/60 HZ
Status	Active

for fluorescent lamps



65040.000 Reflector silver
T16 28W G5 2600lm
ECG

Product description

Housing: metal, white (RAL9002) powder-coated. Screw-fastened end plates. Arrangement as continuous band of light possible. Mounting bracket with screw fixing: metal, for ceiling thicknesses of 12.5-25mm. Electronic control gear, plug and play connectivity with DALI version. 2 cable entries. Through-wiring possible. 5-pole terminal block. Wallwasher reflector: aluminium, anodised, satin matt. Hinged baffle to simplify lamp replacement. Weight 4.00kg

Planning data

Illuminance E_n (lx)

Specifications:

Number of luminaires $n > 5$

Wall height (m) 3

T16 28W G5 2600lm

Offset from wall (m)	1.00		1.00		1.25		1.25	
Luminaire spacing (m)	1.25		1.50		1.25		1.75	
	below the luminaire	between the luminaires	below the luminaire	between the luminaires	below the luminaire	between the luminaires	below the luminaire	between the luminaires
0.250	285	228	258	176	123	117	93	79
0.500	624	559	559	430	396	382	313	252
0.750	619	579	540	463	506	488	390	331
1.000	510	490	439	401	460	450	348	315
1.250	412	403	352	335	394	389	297	278
1.500	333	327	284	275	333	329	250	240
1.750	269	265	230	225	280	277	211	205
2.000	217	213	185	182	235	233	178	174
2.250	176	172	151	149	197	194	150	147
2.500	144	140	125	122	164	162	126	124
2.750	118	116	104	101	137	135	107	105

Cleaning (a)	1				2				3			
Ambient conditions	P	C	N	D	P	C	N	D	P	C	N	D
LMF	0.94	0.89	0.81	0.75	0.91	0.80	0.69	0.59	0.87	0.74	0.61	0.52
RSMF	0.96	0.92	0.87	0.81	0.96	0.92	0.87	0.81	0.96	0.92	0.87	0.81

Hours of operation (h)	4000	8000	12000	16000	20000	2000	6000	10000	14000	18000
LLMF	0.95	0.93	0.91	0.90	0.90	0.96	0.94	0.92	0.91	0.90
LSF	1	1	1	1	1	1	1	1	1	1

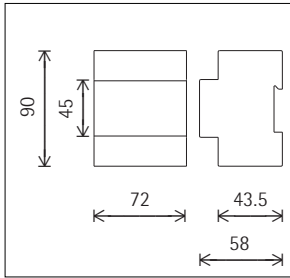
MF	LMFxRSMFxLLMFxLSF
MF	Maintainance Factor
LMF	Luminaire Maintenance Factor
RSMF	Room Surface Maintenance Factor
LLMF	Lamp Lumens Maintenance Factor
LSF	Lamp Survival Factor
P	Room pure
C	Room clean
N	Room normal
D	Room dirty

Accessories



83816.000

DALI switch actuator, double, 16A
Two voltage-free contacts for switching
ohmic, inductive and capacitive loads
max 16A.
DALI interface with two independent
addresses.
Mounting on DIN rail.
Weight 0.21kg

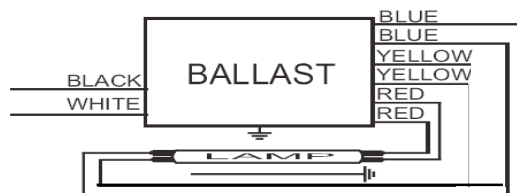


Electrical Specifications

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

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (ANSI Watts)	Ballast Factor	MAX THD %	Power Factor	MAX Lamp Current Crest Factor	B.E.F .
F14T5	1	14	0/-18	0.07	17	1.07	10	0.98	1.7	6.29
F14T5	2	14	0/-18	0.13	33	1.04	10	0.98	1.7	3.15
F21T5	1	21	0/-18	0.10	25	1.06	10	0.98	1.7	4.24
F21T5	2	21	0/-18	0.17	49	1.02	10	0.98	1.7	2.08
* F28T5	1	28	0/-18	0.12	31	1.05	10	0.98	1.7	3.39
F28T5	2	28	0/-18	0.23	61	1.00	10	0.98	1.7	1.64

Wiring Diagram

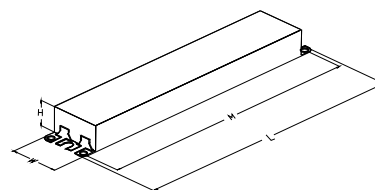


The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

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

Enclosure



Enclosure Dimensions

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

Revised 09/14/2009



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ICN-2S28-N@277

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

Electrical Specifications

Notes:

Section I - Physical Characteristics

- 1.1 Ballast shall be physically interchangeable with standard electromagnetic or standard electronic ballasts, where applicable.
- 1.2 Ballast shall be provided with integral leads or poke-in wire trap connectors color-coded per ANSI C82.11.

Section II - Performance Requirements

- 2.1 Ballast shall be Programmed Start.
- 2.2 Ballast shall contain auto restart circuitry in order to restart lamps without resetting power.
- 2.3 Ballast shall operate from 50/60 Hz input source of _____ (120V through 277V or 347V through 480V) with sustained variations of +/- 10% (voltage and frequency) with no damage to the ballast.
- 2.4 Ballast shall be high frequency electronic type and operate lamps at a frequency above 42 kHz to avoid interference with infrared devices and eliminate visible flicker.
- 2.5 Ballast shall have a Power Factor greater than 0.98 for primary lamp.
- 2.6 Ballast shall have a minimum ballast factor of 1.00 for primary lamp application.
- 2.7 Ballast shall provide for a Lamp Current Crest Factor of 1.7 or less in accordance with lamp manufacturer recommendations.
- 2.8 Ballast input current shall have Total Harmonic Distortion (THD) of less than 20% for Standard models and THD of less than 10% for Centium models when operated at nominal line voltage with primary lamp.
- 2.9 Ballast shall have a Class A sound rating.
- 2.10 Ballast shall have a minimum starting temperature of _____ {-18C (0F) or -29C (-20F)} for primary lamp. Consult lamp manufacturer for temperature versus light output characteristics.
- 2.11 Ballast shall provide Lamp EOL Protection Circuit.
- 2.12 Ballast shall tolerate sustained open circuit and short circuit output conditions without damage.
- 2.13 Ballast shall have a hi-low switching option when operating (4) F54T5/HO lamps to allow switching from 4-2 lamps, 3-2 lamps or 3-1 lamp.
- 2.14 Four-lamp ballast shall have semi-independent lamp operation.

Section III - Regulatory Requirements

- 3.1 Ballast shall not contain any Polychlorinated Biphenyl (PCB).
- 3.2 Ballast shall be Underwriters Laboratories (UL) listed, Class P and Type 1 Outdoor; and Canadian Standards Association (CSA) certified where applicable.
- 3.3 Ballast shall comply with ANSI C62.41 Category A for Transient protection.
- 3.4 Ballast shall comply with ANSI C82.11 where applicable.
- 3.5 Ballast shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 18, Non-Consumer (Class A) for EMI/RFI (conducted and radiated).
- 3.6 Ballast shall comply with UL Type CC rating.

Section IV - Other

- 4.1 Ballast shall be manufactured in a factory certified to ISO 9002 Quality System Standards.
- 4.2 Ballast shall carry a five-year warranty from date of manufacture against defects in material or workmanship, including replacement, for operation at a maximum case temperature of 70C. Ballasts with a "90C" designation in their catalog number shall also carry a three-year warranty at a maximum case temperature of 90C.
- 4.3 Manufacturer shall have a fifteen-year history of producing electronic ballasts for the North American market.

Revised 09/14/2009



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Type F3

FEATURES & SPECIFICATIONS

INTENDED USE — The SPEC-BEAM™ is an ideal one-for-one replacement of common metal halide high bay systems. The optional Cool Running Technology provides trouble-free operation in ambient spaces up to 65°C. Applications include warehousing, manufacturing, commercial facilities and retail. The SPEC-BEAM performs best at mounting heights from 15' to 40'. **Certain airborne contaminants can diminish integrity of acrylic.** [Click here for Acrylic Environmental Compatibility table, for suitable uses.](#)

ATTRIBUTES — Designed for optimum performance using highly efficient T5HO lamps. Best in applications requiring a rugged full body assembly with excellent fixture performance. Multiple optical systems allow the right distribution for the right application. Three mounting choices are available. Available in MVOLT, 347 or 480 volt.

CONSTRUCTION — Full fixture body provides strength and rigidity during shipment and installation. Channel, end caps and socket brackets are manufactured from code grade steel, fixture assembly is riveted and screwed together for added strength. Access to ballast and wiring compartment is accessed from below and is completely tool-less.

FINISH — High-gloss white baked enamel, pretreated with five-stage iron phosphate system. Optional polyester powder coat available.

OPTICAL SYSTEM — All distributions included, precision formed, high performance, 95% reflective, segmented optics utilizing Alanod MIRO® 4 specular aluminum warranted for 25 years. Reflector optics are available in a wide variety of distributions and spacing criteria.

Reflectors are available with uplight (recommended) or solid top that includes heat dissipation slots for heat management venting (2-3% uplight typical).

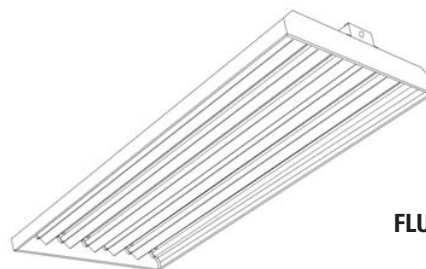
ELECTRICAL SYSTEM — Thermally protected, resettling Class P, HPF, A+ sound rated electronic ballast. AWM, TFM or THHN wire used throughout rated for required temperatures.

Lamps are secured with rotary locking lamp sockets for ease of relamping and to reduce lamps from disconnecting due to vibration or incidental contact.

INSTALLATION — The SPEC-BEAM™ is suitable for suspension by chain, cable or monopoint-mounted with appropriate accessories. Fixture must be suspended mount for ceiling structures.

LISTING — UL Listed. CSA Certified. (UL 1598 and CSA C22.2 No. 250.0-00.) For ambient operation up to 55°C. Suitable for damp locations.

Catalog Number	
Notes	Type



SPEC-BEAM™

FGB

FLUORESCENT HIGH BAY
T5HO LampsCOOL
TECHNOLOGY

PATENT PENDING

T5HO
Technology

Specifications

#Lamps:	2 or 3	4	6
Length:	48 (1220)	48 (1220)	48 (1220)
Width:	12 (305)	16 (407)	24 (610)
Depth:	4-1/2 (111)	4-1/2 (111)	4-3/4 (121)
Weight:	16 lbs (7.26 kg)	17 lbs (7.71 kg)	19 lbs (8.62 kg)

All dimensions are inches (millimeters).

Specifications subject to change without notice.

WARRANTY — Ballast Warranty - five years when operated at ambient temperatures up to 55°C, three years when operated at ambient temperatures up to 65°C. Lensed fixtures are warranted for five years when operated at ambient temperatures up to 40°C.

ORDERING INFORMATION

Lead times will vary depending on options selected. Consult with your sales representative.

Example: FGB24 6 54T5HO T1X20 MVOLT 1/41/2 GEB10PS LP841

Series	Shielding ⁴	Voltage	Lamp color
FGB14 FGB164 FGB24	(blank) No shielding A12125 Pattern 12 acrylic, 0.125" A12125WG Pattern 12 acrylic, 0.125" w/wireguard in door frame ACL Clear acrylic, 0.125" ACLWG Clear acrylic, 0.125" w/wireguard in door frame PCL125 Clear polycarbonate, 0.125" PCL125WG Clear polycarbonate, 0.125" w/wireguard in door frame NLWG No lens; wireguard in door frame	MVOLT 120V-277V HVOLT 347V-480V	(blank) No lamps LP830 85 CRI, 3000°K, std. life LP835 85 CRI, 3500°K, std. life LP841 85 CRI, 4100°K, std. life LP850 85 CRI, 5000°K, std. life
Number of lamps ¹	Distribution/Reflector ⁴	Ballast configuration	Options
2 3 4 6		(blank) All two-lamp ballasts 1/3 One, three-lamp ballast 1/4 One, four-lamp ballast 1/41/2 One, four-lamp and one, two-lamp ballast 2/3 Two, three-lamp ballasts	OUTCTR Wiring leads through back center of fixture ⁷ PAF Powder coat after fabrication PAFAL Aluminum construction, PAF 20GA 20-gauge steel construction TC Top cover panels ⁴ WG Wireguard, 11 gauge, external mount MSI Occupancy sensor pre-wired (aisle) ⁵ MSI360 Occupancy sensor pre-wired (360°) ⁵ MSIPE Occupancy sensor pre-wired with photocell ⁵ EL14 Emergency battery pack (900 lumens) ⁵
Lamp type	Distribution	Reflector	Ballast
54T5HO 54W T5HO	F1 Focus (0.9>SC) T1 Task (0.9<1.2 SC) N1 Normal (1.2<1.4 SC) S1 Spread (1.4<1.8 SC) B1 Broad (1.8<SC) ²	X20 Specular aluminum X20U Specular aluminum w/uplight D20 White powder coat ³ D20U White powder coat w/uplight ³	ACRB Cool Running ⁴ GEB10PS T5HO electronic, ≤10% THD, programmed rapid start

NOTES:

- See Configurations table for availability.
- Not available with prismatic lens option.
- Available with N1 (normal distribution) only.
- 5/55 warranty for open fixtures only. Fixtures should be mounted at a minimum plenum height of 18".
- Must specify voltage.
- UL listed for 55°C. Output in emergency mode carries with ambient temperature (approx. 944 lumens at 25°C and 911 lumens at 45°C). Single-lamp operation only. Not available with HVOLT. Requires some assembly in the field for six-lamp fixtures.
- Every distribution not available in every lamp configuration.

Accessories

Order as a separate catalog number.

IBAC120M20	10' adjustable aircraft cable, 2-hook, Y hanger (one pair)
IBAC240M20	20' adjustable aircraft cable, 2-hook, Y hanger (one pair)
HSD36	3' jack chain with hanger (one pair)
THSD	Monopoint hanger with 3/4" KO
THSDHB	Monopoint hanger with 3/4" hub
THSDSK	Side covers for monopoint hanger (one pair)

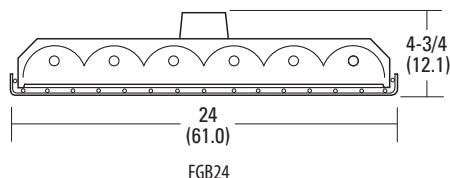
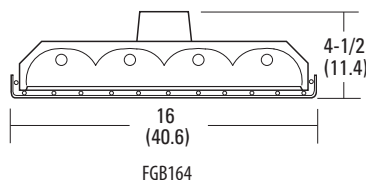
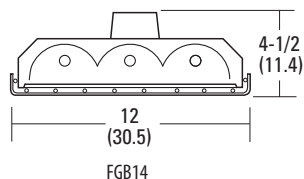
FGB T5HO Fluorescent High Bay

Configurations

Series	Number of lamps	Width	Height	Length
FGB14	2 or 3	12 (30.5)	4-1/2 (11.4)	48 (121.9)
FGB164	4	16 (40.6)	4-1/2 (11.4)	48 (121.9)
FGB24	6	24 (61.0)	4-3/4 (12.1)	48 (121.9)

DIMENSIONS

All dimensions are in inches (millimeters).



Cord Set Option:

Add suffix to end of catalog number, specify voltage. All cord sets are 18/3, 6', white unless otherwise noted. Other configurations available, consult factory.

Suffix	Description
CS1W	Straight plug, 120V
CS3W	Twist lock, 120V
CS7W	Straight plug, 277V
CS11W	Twist-lock, 277V
CS25W	Twist-lock, 347V
CS97W	Twist-lock, 480V
CS93W	600V SO white cord, no plug (no voltage required)

PHOTOMETRICS

Calculated using the zonal cavity method in accordance with IESNA LM41 procedure. Floor reflectances are 20%. Lamp configurations shown are typical. All data based on 25°C. Full photometric data on these and other configurations available upon request.

FGB164 4 54T5HO B1X20
TEST NO: LTL 14950
LUMENS PER LAMP: 4400

FGB164 4 54T5HO T1X20U
TEST NO: LTL 14955
LUMENS PER LAMP: 4400

FGB24 6 54T5HO T1X20U
TEST NO: LTL 14967
LUMENS PER LAMP: 4400

Coefficients of Utilization										
pc	pw	80%			20%			30%		
		50%			50%			50%		
		50%	30%	10%	50%	30%	10%	50%	30%	10%
0	108	108	108	100	100	100	95	95	95	
1	95	91	88	88	85	83	84	82	80	
2	83	76	71	77	72	68	73	69	66	
3	72	64	58	67	61	56	64	59	55	
4	63	55	49	59	52	47	57	51	46	
5	56	48	41	52	45	40	50	44	39	
6	50	41	35	47	40	35	45	39	34	
7	45	37	31	42	35	30	41	34	30	
8	40	32	27	38	31	26	37	31	26	
9	37	29	24	35	28	23	34	27	23	
10	34	26	21	32	25	21	31	25	21	

Coefficients of Utilization										
pc	pw	80%			20%			30%		
		50%			50%			50%		
		50%	30%	10%	50%	30%	10%	50%	30%	10%
0	110	110	110	99	99	99	92	92	92	
1	98	94	91	88	86	83	83	81	79	
2	86	80	76	78	74	70	74	70	67	
3	77	70	64	70	65	60	66	61	58	
4	69	61	55	63	57	52	59	54	50	
5	62	54	48	57	51	46	54	49	44	
6	56	48	43	52	46	41	49	44	40	
7	51	44	38	48	41	37	45	40	36	
8	47	40	34	44	38	33	42	36	32	
9	43	36	31	41	34	30	39	33	29	
10	40	33	29	38	32	28	36	31	27	

Coefficients of Utilization										
pc	pw	80%			20%			30%		
		50%			50%			50%		
		50%	30%	10%	50%	30%	10%	50%	30%	10%
0	113	113	113	102	102	102	95	95	95	
1	100	96	93	90	88	85	85	83	81	
2	88	82	77	80	76	72	75	72	68	
3	78	71	65	71	66	61	67	63	59	
4	70	62	56	64	58	53	60	55	51	
5	63	55	49	58	52	47	55	49	45	
6	57	49	43	53	46	41	50	44	40	
7	52	44	39	48	42	37	46	40	36	
8	48	40	35	45	38	34	42	37	33	
9	44	37	32	41	35	31	39	34	30	
10	41	34	29	38	32	28	37	31	27	

Zonal Lumen Summary			
Zone	Lumens	% Lamp	% Fixture
0° - 30°	3288.8	18.7	20.4
0° - 40°	6209.5	35.3	38.5
0° - 60°	12719.4	72.3	78.8
0° - 90°	15576.3	88.5	96.5
90° - 180°	572.5	3.3	3.5
0° - 180°	16148.8	91.8	100.0

Zonal Lumen Summary			
Zone	Lumens	% Lamp	% Fixture
0° - 30°	5287.2	30.0	31.7
0° - 40°	7953.9	45.2	47.7
0° - 60°	12351.2	70.2	74.0
0° - 90°	14648.9	83.2	87.8
90° - 180°	2043.1	11.6	12.2
0° - 180°	16692.0	94.8	100.0

Zonal Lumen Summary			
Zone	Lumens	% Lamp	% Fixture
0° - 30°	8032.9	30.4	31.3
0° - 40°	12030.4	45.6	46.8
0° - 60°	18791.8	71.2	73.1
0° - 90°	22563.5	85.5	87.8
90° - 180°	3137.9	11.9	12.2
0° - 180°	25701.4	97.4	100.0



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Sheet #: FGB-T5HO

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Lithonia Lighting

Industrial

One Lithonia Way, Conyers, GA 30012
Phone: 770-922-9000 Fax: 770-981-8141
www.lithonia.com

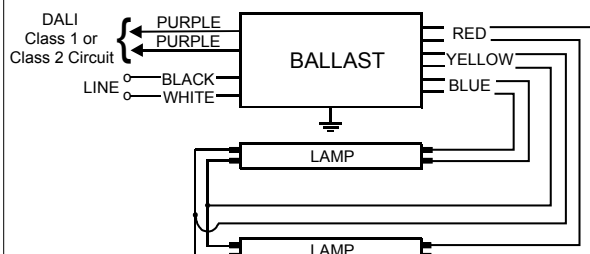
IDA-2S54@277

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

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (Watts) (min/max)	Ballast Factor (min/max)	MAX THD %	Power Factor	Lamp Current Crest Factor	B.E.F.
* F54T5/HO	2	54	50/10	0.45	24/125	0.03/1.00	10	0.98	1.7	0.80
FC12T5/HO	2	55	50/10	0.42	24/114	0.03/0.90	10	0.98	1.7	0.79
FT55W/2G11	2	55	50/10	0.42	24/114	0.03/0.90	10	0.98	1.7	0.79

Wiring Diagram

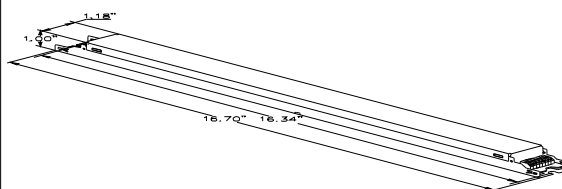


The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

	in.	cm.		in.	cm.
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	Black/White		0
Violet		0	Red/White		0

Enclosure



Enclosure Dimensions

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

Revised 01/16/2004



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PHILIPS LIGHTING ELECTRONICS N.A.

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Tel: 800-322-2086 · Fax: 888-423-1882 · www.philips.com/advance

Customer Support/Technical Service: 800-372-3331 · OEM Support: 866-915-5886



IDA-2S54@277

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

Electrical Specifications

Notes:

Section I - Physical Characteristics

- 1.1 Ballast shall be physically interchangeable with standard electromagnetic or standard electronic ballasts, where applicable.
- 1.2 Ballast shall be available in a plastic/metal can or all metal can construction to meet all plenum requirements.
- 1.3 Ballast shall be provided with poke-in wire trap connectors or integral leads color coded per ANSI C82.11.

Section II - Performance Requirements

- 2.1 Ballast shall be Programmed Start.
- 2.2 Ballast shall be provided with integral protection circuitry to withstand connection of low voltage control leads to mains power supply. In this event, ballast shall default to maximum light output.
- 2.3 Ballast shall contain auto restart circuitry in order to restart lamps without resetting power.
- 2.4 Ballast shall operate from 50/60 Hz input source of 120V or 277V with sustained variations of +/- 10% (voltage and frequency). IntelliVolt models shall operate from 50/60 Hz input source of 120V through 277V with sustained variations of +/- 10% (voltage and frequency).
- 2.5 Ballast shall be high frequency electronic type and operate lamps at a frequency above 42 kHz to avoid interference with infrared devices and eliminate visible flicker.
- 2.6 Ballast shall have a Power Factor greater than 0.98 at full light output and greater than 0.90 throughout the dimming range for primary lamp.
- 2.7 Ballast shall have a minimum ballast factor of 1.00 at maximum light output and 0.03 at minimum light output for primary lamp application.
- 2.8 Ballast shall provide for a Lamp Current Crest Factor of 1.7 or less.
- 2.9 Ballast input current shall have Total Harmonic Distortion (THD) of less than 10% when operated at nominal line voltage with primary lamp.
- 2.10 Ballast shall have a Class A sound rating.
- 2.11 Ballast shall have a minimum starting temperature of 10C (50F) for primary lamp.
- 2.12 Ballast shall provide Lamp EOL Protection Circuit for all T5, T5/HO and CFL lamps.
- 2.13 Ballast shall control lamp light output from 100% - 3% relative light output for T8 and CFL lamps and 100% - 1% relative light output for T5/HO lamps.
- 2.14 Ballast shall ignite the lamps at any light output setting without first going to another output setting.
- 2.15 Ballast shall tolerate sustained open circuit and short circuit output conditions.

Section III - Regulatory Requirements

- 3.1 Ballast shall not contain any Polychlorinated Biphenyl (PCB).
- 3.2 Ballast shall be Underwriters Laboratories (UL) listed, Class P and Type 1 Outdoor; and Canadian Standards Association (CSA) certified where applicable.
- 3.3 Ballast shall comply with ANSI C62.41 Category A for Transient protection.
- 3.4 Ballast shall comply with ANSI C82.11 where applicable.
- 3.5 Ballast shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 18, Non-Consumer (Class A) for EMI/RFI (conducted and radiated).
- 3.6 Ballast shall comply with NEMA 410 for in-rush current limits.

Section IV - Other

- 4.1 Ballast shall be manufactured in a factory certified to ISO 9001 Quality System Standards.
- 4.2 Ballast shall carry a _____ warranty from date of manufacture against defects in material or workmanship for operation at a maximum case temperature of _____. (Go to our web site for up to date warranty information: www.philips.com/advancewarranty).
- 4.3 Manufacturer shall have a twenty-year history of producing electronic ballasts for the North American market.
- 4.4 Ballast shall be controlled by a compatible DALI protocol control.
- 4.5 Ballast shall be Philips Advance part # _____ or approved equal.

Revised 01/16/2004



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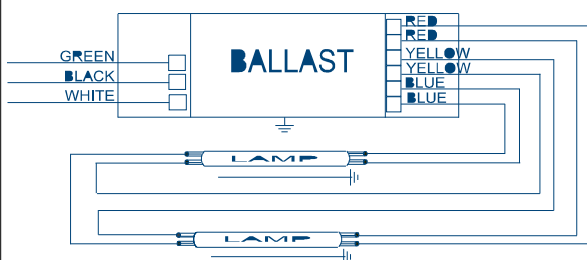
ICN-2S54-90C@277

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

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (ANSI Watts)	Ballast Factor	MAX THD %	Power Factor	MAX Lamp Current Crest Factor	B.E.F .
F54T5/HO	1	54	-20/-29	0.23	62	1.02	10	0.96	1.7	1.65
* F54T5/HO	2	54	-20/-29	0.43	117	1.00	10	0.98	1.7	0.85

Wiring Diagram

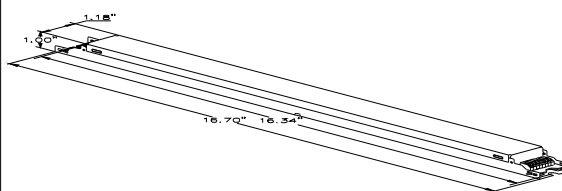


The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

	in.	cm.		in.	cm.
Black	31	78.7	Yellow/Blue	0	0
White	31	78.7	Blue/White	0	0
Blue	28	71.1	Brown	0	0
Red	28	71.1	Orange	0	0
Yellow	48	121.9	Orange/Black	0	0
Gray	0	0	Black/White	0	0
Violet	0	0	Red/White	0	0

Enclosure



Enclosure Dimensions

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

Revised 03/11/2009



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ICN-2S54-90C@277

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

Electrical Specifications

Notes:

Section I - Physical Characteristics

- 1.1 Ballast shall be physically interchangeable with standard electromagnetic or standard electronic ballasts, where applicable.
- 1.2 Ballast shall be provided with integral leads or poke-in wire trap connectors color-coded per ANSI C82.11.

Section II - Performance Requirements

- 2.1 Ballast shall be Programmed Start.
- 2.2 Ballast shall contain auto restart circuitry in order to restart lamps without resetting power.
- 2.3 Ballast shall operate from 50/60 Hz input source of _____ (120V through 277V or 347V through 480V) with sustained variations of +/- 10% (voltage and frequency).
- 2.4 Ballast shall be high frequency electronic type and operate lamps at a frequency above 42 kHz to avoid interference with infrared devices and eliminate visible flicker.
- 2.5 Ballast shall have a Power Factor greater than 0.98 for primary lamp.
- 2.6 Ballast shall have a minimum ballast factor of 1.00 for primary lamp application.
- 2.7 Ballast shall provide for a Lamp Current Crest Factor of 1.7 or less.
- 2.8 Ballast input current shall have Total Harmonic Distortion (THD) of less than 20% for Standard models and THD of less than 10% for Centium models when operated at nominal line voltage with primary lamp.
- 2.9 Ballast shall have a Class A sound rating.
- 2.10 Ballast shall have a minimum starting temperature of _____ {-18C (0F) or -28C (-20F)} for primary lamp. Consult lamp manufacturer for temperature versus light output characteristics.
- 2.11 Ballast shall provide Lamp EOL Protection Circuit.
- 2.12 Ballast shall tolerate sustained open circuit and short circuit output conditions.
- 2.13 Four-lamp ballast shall have (semi-independent or independent) lamp operation.

Section III - Regulatory Requirements

- 3.1 Ballast shall not contain any Polychlorinated Biphenyl (PCB).
- 3.2 Ballast shall be Underwriters Laboratories (UL) listed, Class P and Type 1 Outdoor; and Canadian Standards Association (CSA) certified where applicable.
- 3.3 Ballast shall comply with ANSI C62.41 Category A for Transient protection.
- 3.4 Ballast shall comply with ANSI C82.11 where applicable.
- 3.5 Ballast shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 18, Non-Consumer (Class A) for EMI/RFI (conducted and radiated).
- 3.6 Ballast shall comply with UL Type CC rating.
- 3.7 Ballast shall comply with NEMA 410 for in-rush current limits.

Section IV - Other

- 4.1 Ballast shall be manufactured in a factory certified to ISO 9001 Quality System Standards.
- 4.2 Ballast shall carry a five-year warranty from date of manufacture against defects in material or workmanship, including replacement, for operation at a maximum case temperature of 70C. Ballasts with a "90C" designation in their catalog number shall also carry a three-year warranty at a maximum case temperature of 90C.
- 4.3 Manufacturer shall have a twenty-year history of producing electronic ballasts for the North American market.

Revised 03/11/2009



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FLEXIBLE CATHODE LIGHT STRIP (FCLS)



The Flexible Cathode Light Strip (FCLS) brings cold cathode lighting into the 21st century. It effectively eliminates the bulky magnetic transformers, ballasts, and fixture dimensions associated with traditional component-based cold-cathode lighting systems. It combines all the best features of shadowless long-life, high-brightness cold-cathode fluorescent lighting, with the simplicity of a self-contained, discreet, flexible fixture.

Each beautifully-designed fixture can conform to almost any shape or size (straight, curved or bent) of Cathode Lighting Systems' custom or standardized lamps, in an almost infinite variety of deeply-saturated colors and high color-rendering whites. The Flexible Cathode Light Strip (FCLS) is completely modular, low profile (only 2 3/4" tall, including the lamp) installs in minutes, and offers the convenience of "plug-and-play" connections between fixtures. Lamps simply snap in and out, and all fixtures are provided as standard, with integral, inaudible electronic dimming ballasts.

"FLEXIBLE CATHODE LIGHT STRIP...BECAUSE THE WORLD IS ROUND"

 **UL LISTED** Patent 7,293,895
Patent 6,454,431

 **CATHODE
LIGHTING
SYSTEMS**
INNOVATIVE LIGHTING TECHNOLOGY

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email: info@CathodeLightingSystems.com • website: www.CathodeLightingSystems.com

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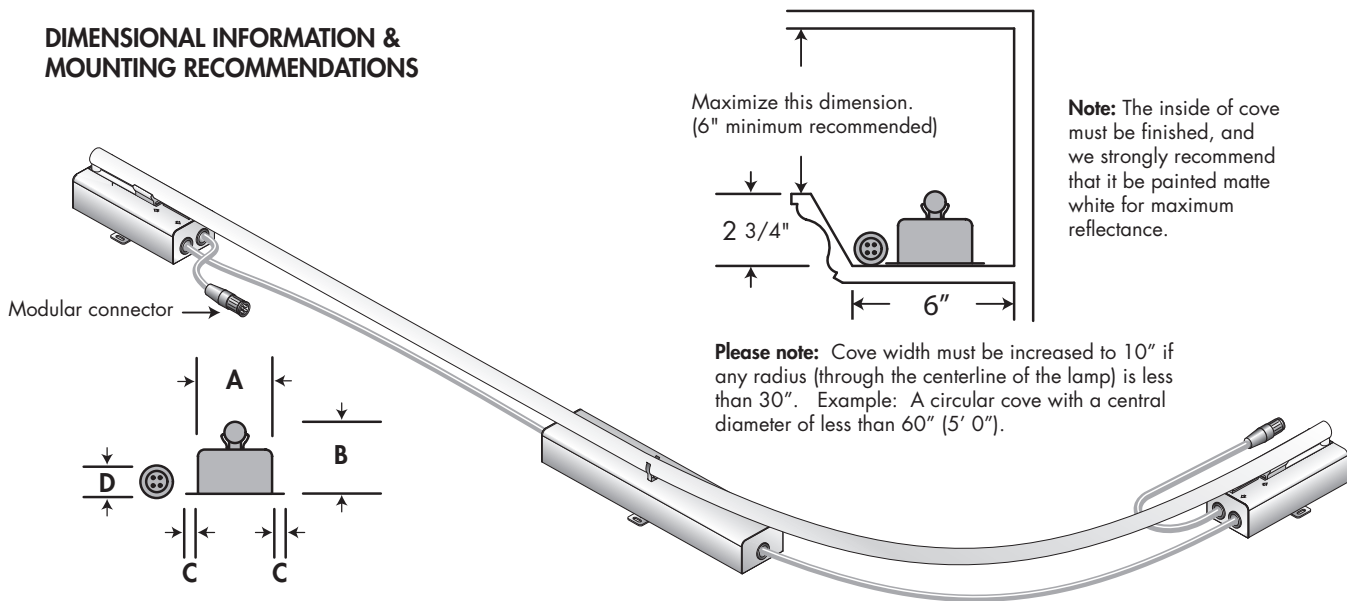
FLEXIBLE CATHODE LIGHT STRIP (FCLS)

-FEATURES & BENEFITS
-DIMENSIONAL INFORMATION
-MOUNTING RECOMMENDATIONS

FEATURES & BENEFITS

- Illumination is seamless, from end to end, with no dark spots or socket shadow.
- Each luminaire can flex or conform to almost any shape or size of lamp (straight, curved or bent) up to 7' 6" long.
- Reliable, long-life T6 cold cathode lamps (up to 50,000 hours of life) lamps are available in standard or custom straight lengths, and can be custom-curved or bent to conform to almost any architectural requirement.
- Lamp brightness is comparable to T5 fluorescent.
- Lamps snap in and out of luminaires via innovative zero-clearance lamp bases and lampholders.
- New electronic ballast technology offers inaudible operation.
- Extremely low profile, only 2 3/4" tall with lamp installed
- External "plug and play" modular connectors allow rapid installation, and eliminate all manual wiring between luminaires.
- Luminaires are completely self contained. Absolutely no disassembly of the luminaire is required to install. Simply install the luminaire on its mounting surface, snap lamp in, and plug into the next luminaire.
- All luminaires are dimmable, and are compatible with 3-wire fluorescent dimmers.
- All luminaires dim at the same rate, regardless of variations in lamp length or shape.
- Wide color selection
- UL-Listed  US LISTED

DIMENSIONAL INFORMATION & MOUNTING RECOMMENDATIONS



- A. Width: 2 3/4"
- B. Height (with lamp): 2 3/4"
- C. Mounting tab width: 5/8"
- D. Modular connector diameter: 1 5/16"

FLEXIBLE CATHODE LIGHT STRIP (FCLS)

LAMP COLORS & ORDERING INFORMATION

LAMP COLORS

WHITE LAMPS (All whites are triphosphor with a CRI of 90+)

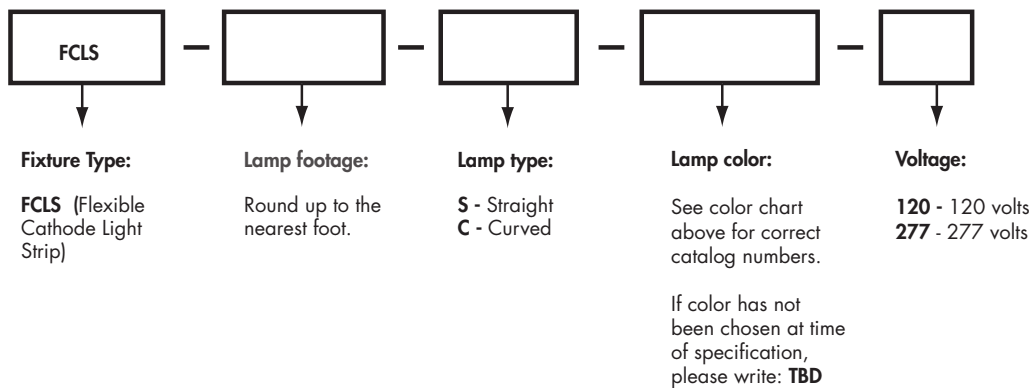
Cat. No.	Shade of White	Lumens per foot	Efficacy
28TC	Incandescent white - 2800°K	772	77.2 lumens/watt
30TC	Warm white - 3000°K	759	76.2 lumens/watt
35TC	Soft white - 3500°K	780	78.2 lumens/watt
42TC	Cool white - 4200°K	750	75.3 lumens/watt
50TC	Ice white - 5000°K	738	73.2 lumens/watt
65TC	Daylight - 6500°K	751	75.4 lumens/watt

Photometric information: All photometric values provided by LTL (Luminaire Testing Laboratories, Allentown, PA) .

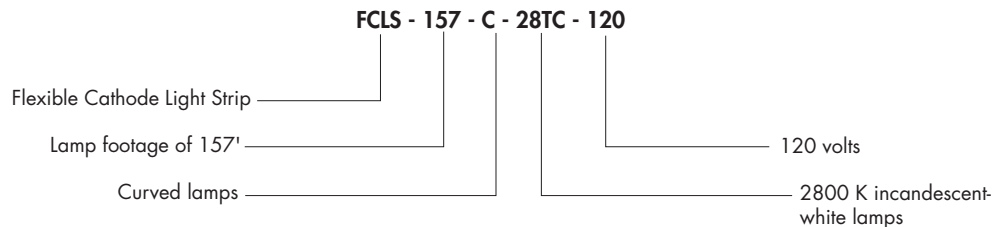
COLORED LAMPS:

Pink White (PW)
Hot Pink (HP)
Red (RD)
Lavender (LV)
Purple (PR)
Sky Blue (SB)
Deep Blue (DB)
Turquoise (TQ)
Aquamarine (AQ)
Standard Green (GR)
Bright Green (BG)
Gold (GD)
Canary Yellow (CY)
Orange (OR)
Amber (AM)

ORDERING INFORMATION



Example: One circular light cove, 157' in circumference. Lamp color is 2800K Incandescent white. Fixtures will operate at 120 volts.



FLEXIBLE CATHODE LIGHT STRIP (FCLS)**ELECTRICAL INFORMATION & SPECIFICATIONS****ELECTRICAL INFORMATION**

Luminaire's ballast	Primary voltage	Primary amps / VA	VA per foot*	Watt consumption per foot*	Dimming protocol	Maximum luminaires
Electronic	120 volts 50/60 Hz	1.4 amps / 170 VA	22.7	12	3-wire fluorescent	11 @ 120 volts
Electronic	277 volts 50/60 Hz	.7 amps / 194 VA	25.9	13.7	3-wire fluorescent	22 @ 277 volts

*Values are based on maximizing average lamp length at 7'6".

Dimming: Three-wire fluorescent (switched hot, dimmed hot, and neutral). Lutron is recommended.

Primary Wiring: Branch circuit wiring must contain three (3) conductors + ground in order to utilize dimming feature.

Branch circuit requirements: FCLS must be powered by a dedicated circuit only. Maximum breaker size is 20 amps.

SPECIFICATIONS:

Luminaire: Luminaire shall be Cathode Lighting Systems model FCLS (Flexible Cathode Light Strip), and shall be field-adjustable to accommodate straight, curved or bent lamps up to 7'6" in length. Luminaires shall provide a continuous, uninterrupted line of light when installed as instructed. Luminaires shall be provided with integral male and female power connectors at each end to electrically connect each luminaire to the next. Luminaires shall be satin-anodized .050" aluminum and stainless steel and shall be permanently connected with matching flexible cable. No disassembly, or entry into the internal parts of the luminaire shall be required during installation, either for wiring or for mounting.

Lamps: Shall be 50,000-hour T6 cold-cathode fluorescent, color as specified, in curvatures, shapes and sizes dictated by the architectural requirements. Lamps shall be provided with single-pin bases for zero-clearance snap-in installation and removal into lampholders. (Lamps which are hard wired to the power supply in parallel or series are not acceptable alternatives). Lamps shall be manufactured with butt-sealed ends to provide complete illumination at each lamp end, and shall have provisions to be locked into place, utilizing the luminaire's lamp-locking clips. Lamps shall produce 780 lumens per foot (35TC) and manufacturer shall provide independent test lab reports to substantiate.

Integral Ballast: Shall be electronic 990 volt, high-output, instant-start cold cathode, class P thermally protected, sound rated A and shall automatically de-energize upon removal of lamps from the luminaire.

Approvals: Luminaire shall be UL and cUL-listed under UL category: IEUZ Fluorescent surface-mounted luminaires.

Manufacturer: Shall be Cathode Lighting Systems Inc., Gaithersburg, MD - USA (800) 551-5012.

Website: www.CathodeLightingSystems.com



8020 Queenair Drive, Gaithersburg, MD • ph: 301 921 4120 fax: 301 963 3050
email: info@CathodeLightingSystems.com • website: www.CathodeLightingSystems.com

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SYSTEM BNP

Standard-Output Ballast-Operated Cold Cathode

Type W2

Photometry

System type: BNP (standard-output ballast-operated cold cathode)

Lamp operating current: 100 mA

CATALOG NUMBER: BNP

LUMINAIRE: ASSEMBLED PLYWOOD COVE PAINTED WHITE, NO ENCLOSURE

LAMPS: ONE 4' 25MM 42TC COLD CATHODE LAMP RATED AT 1432 LUMENS

BALLAST: CATHODE LIGHTING SYSTEMS

MOUNTING: WALL

LUMEN TO CANDELA RATIO USED = 9.18

TOTAL INPUT WATTS = 26.4 AT 100 mA OPERATING CURRENT

THE 0 DEGREE PLANE IS PERPENDICULAR TO THE LAMPS.

CANDELA DISTRIBUTION											FLUX
	0.0	22.5	45.0	67.5	90.0	112.5	135.0	157.5	180.0		
0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0
35	0	0	2	3	0	0	3	3	0	1	0
45	4	6	7	7	2	4	7	7	0	3	0
55	14	15	13	8	7	9	6	7	0	9	0
65	34	39	34	21	6	14	12	6	0	19	0
75	64	66	57	38	6	21	12	5	0	32	0
85	100	101	85	57	11	21	14	6	0	49	0
90	133	144	120	80	18	25	14	6	0	0	100
95	221	231	198	126	31	28	16	8	0	0	140
105	335	315	258	173	78	36	19	7	0	0	158
115	370	350	297	227	136	47	19	7	0	0	165
125	391	375	333	273	191	77	22	7	0	0	166
135	411	397	365	308	238	149	49	7	0	0	158
145	422	409	381	332	279	236	86	54	48	136	95
155	418	406	384	349	311	280	246	117	98	33	33
165	400	389	375	354	332	314	298	282	288		
175	368	360	356	349	342	336	331	327	333		
180	344	344	344	344	344	344	344	344	344		

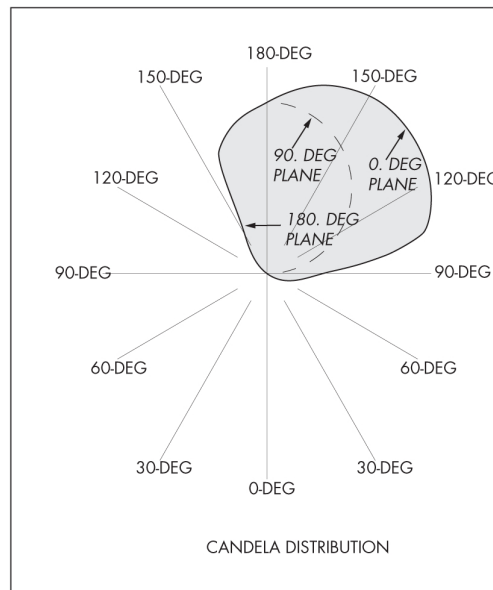
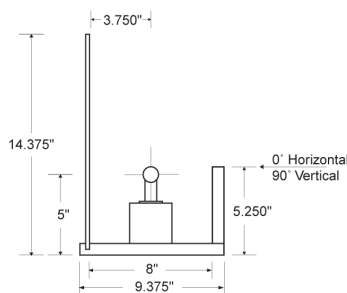
ZONAL LUMEN SUMMARY

ZONE	LUMENS	%LAMP	%FIXT
0-30	0	0.0	0.0
0-40	1	0.1	0.1
0-60	13	0.9	1.0
0-90	112	7.9	8.9
90-120	397	27.7	31.5
90-130	563	39.3	44.6
90-150	886	61.9	70.2
90-180	1150	80.3	91.1
0-180	1263	88.2	100.0

TOTAL LUMINAIRE EFFICIENCY: 88.2%

TOTAL REFLECTANCE OF PAINT: 90.4%

CIE TYPE: INDIRECT



Complete photometric information is available on our website at www.CathodeLightingSystems.com. Files are in standard IES format and may be downloaded from the *Photometrics* section.

RC	80				70				50				30				10				0	COEFFICIENTS OF UTILIZATION - ZONAL CAVITY METHOD EFFECTIVE FLOOR CAVITY REFLECTANCE 0.20
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	50	30	10	0	
0	86	86	86	86	75	75	75	75	53	53	53	34	34	34	16	16	16	8			8	
1	77	72	69	65	66	63	60	57	44	42	40	27	26	25	12	11	11	4			4	
2	69	62	57	52	59	54	49	45	38	35	32	23	21	20	10	9	8	2			2	
3	63	54	48	43	54	47	42	37	33	29	26	20	18	16	8	7	6	1			1	
4	57	48	41	36	49	41	35	31	29	25	22	18	15	13	7	6	5	1			1	
5	52	42	35	30	45	36	31	26	26	22	19	16	13	11	6	5	4	0			0	
6	48	37	31	26	41	32	27	22	23	19	16	14	12	10	6	4	3	0			0	
7	44	34	27	22	38	29	23	19	21	17	14	13	10	8	5	4	3	0			0	
8	41	30	24	19	35	26	21	17	19	15	12	11	9	7	5	3	3	0			0	
9	38	27	21	17	32	24	18	15	17	13	10	10	8	6	4	3	2	0			0	
10	35	25	19	15	30	22	16	13	15	12	9	9	7	6	4	3	2	0			0	

NOTE:

The zonal cavity calculation technique is accurate when luminaires within the symmetric candela distributions are employed and when the luminaires are located symmetrically throughout the room. This unit has special characteristics. Therefore these coefficients should be used with caution.

SYSTEM BNP

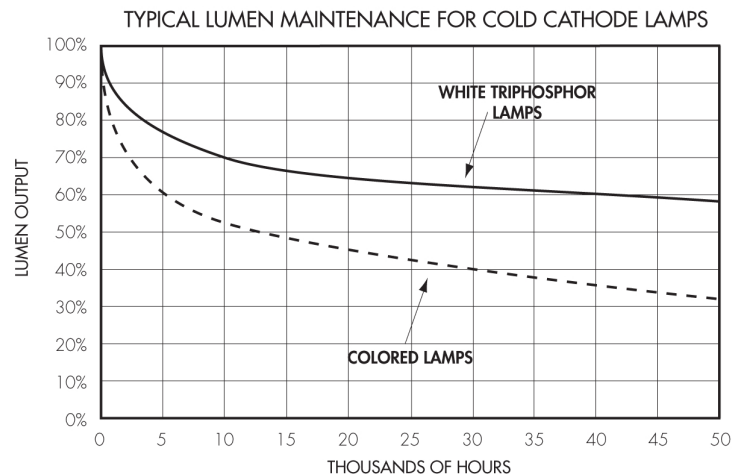
Standard-Output Ballast-Operated Cold Cathode

Photometry (cont'd.)

COLD CATHODE LAMP LUMENS PER FOOT

Lamp Color	Catalog Number	Lumens per Foot System BNP (100 mA lamp current)
Incandescent White	28TC	371
Warm White	30TC	386
Soft White	35TC	374
Cool White	42TC	358
Ice White	50TC	364
Daylight	65TC	369
Pink White	PVW	216
Hot Pink	HP	198
Ruby Red	RR	72
Lavender	LV	234
Purple	PR	180
Deep Purple	DP	36
Sky Blue	SB	306
Deep Blue	DB	252
Cobalt Blue	CB	195
Turquoise	TQ	355
Aquamarine	AQ	288
Green	GR	360
Emerald Green	EG	162
Gold	GD	182
Novial Gold	NG	126
Canary Yellow	CY	196
Orange	OR	144

Photometric information by ITL (Independent Test Laboratories), Boulder, CO; LTL (Luminaire Testing Laboratory), Allentown, PA; and Cathode Lighting Systems Inc.



Infrared Ceiling Mount Sensor

Type 01 and 02



The LOS-CIR Series ceiling-mount passive infrared sensors can integrate into Lutron systems or function as stand-alone controls using a Lutron power pack. The sensor uses a small semiconductor heat detector that resides behind a multi-zone optical lens. The sensor's detector is sensitive to the heat emitted by the human body. In order to trigger the sensor, the source of heat must move from one range of detection to another. Non-moving hot objects will not cause the lights to turn on.

Features

- Intelligent, continually adapting passive infrared (PIR) sensor
- Passive infrared sensing
- Reliable motion detection with high error immunity
- Snap-locks to ceiling-mounted cover plate
- Non-Volatile Memory: settings saved in protected memory are not lost during power outages
- 450 to 1500 sq.ft. (42 to 140 m²) coverage when mounted on an 8 - 12 ft. (2.4 - 3.7 m) ceiling
- Affords choice of turning lights off or dimming to a preset level in the unoccupied state when integrated with a Lutron system.

Models Available

Cat. No.	Color	Coverage	Field of View
LOS-CIR-450-WH	White	450 sq.ft. (42 m ²)	360°
LOS-CIR-1500-WH	White	1500 sq. ft. (140 m ²)	360°

Self-Adaptive Feature

The LOS-CIR Series ceiling-mount occupant sensors provides reliable detection with high error immunity. The internal microprocessor analyzes the information from the PIR technology and determines the optimum setting to use in order to properly cover the space.

Job Name:	Model Numbers:
Job Number:	

Specifications

Timer Adjustment

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

LED Lamp

- Red: infrared motion detected

Housing

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

Power

- Operating voltage: 20 - 24 V_{AC}, PELV (Class 2: USA) low-voltage
- Operating current: 33 mA nominal
- Control output: 20 - 24 V_{AC} active high logic control signal with short-circuit protection, open collector when unoccupied
- UL and CUL listed

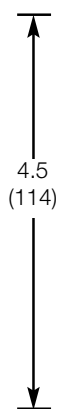
Operating Environment

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

Dimensions



Front View



Side View

Measurements are in inches (mm)

Job Name:

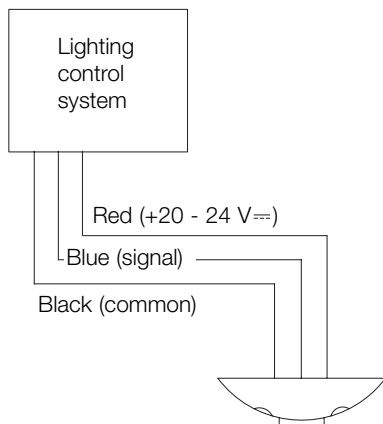
Model Numbers:

Job Number:

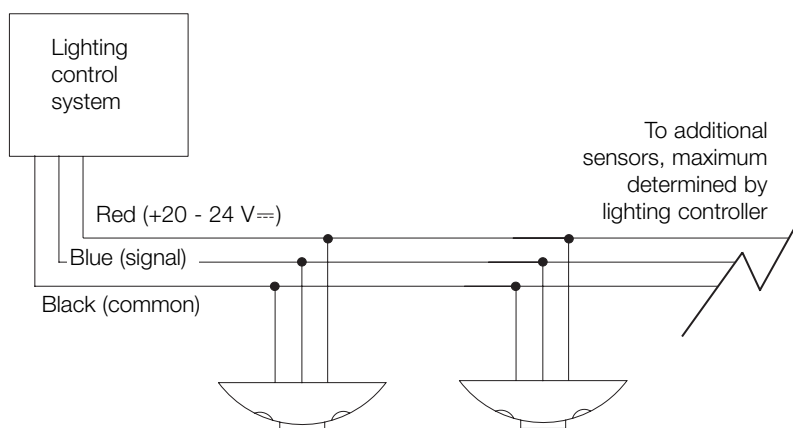
Wiring

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

Single Sensor to System



2 or More Sensors to System



Power Supply Options

Lutron Lighting Control System

Digital microWATT™

EcoSystem®

GRAFIK 5000 / 6000 / 7000

GRAFIK Eye® 3000 / 4000

HomeWorks®

LCP128™

microWATT®

RadioRA®

RadioTouch®

Softswitch128®

Power Pack Required?

No

No

No, when used with seeTouch® wallstations with occupant sensor connections.

Yes

Yes

No, when used with *seeTouch* wallstations with occupant sensor connections.

No

Yes

No

No, when used with *seeTouch* wallstations with occupant sensor connections.

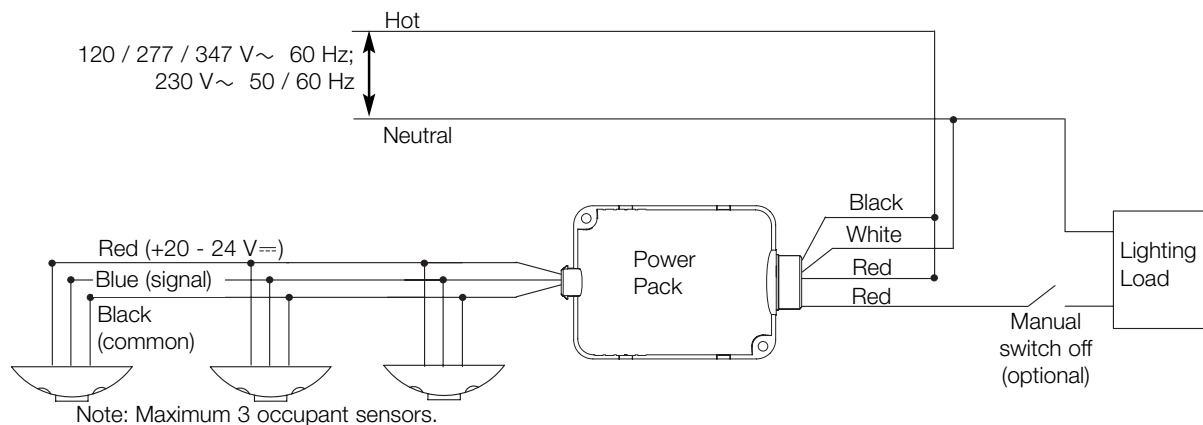
Job Name:

Model Numbers:

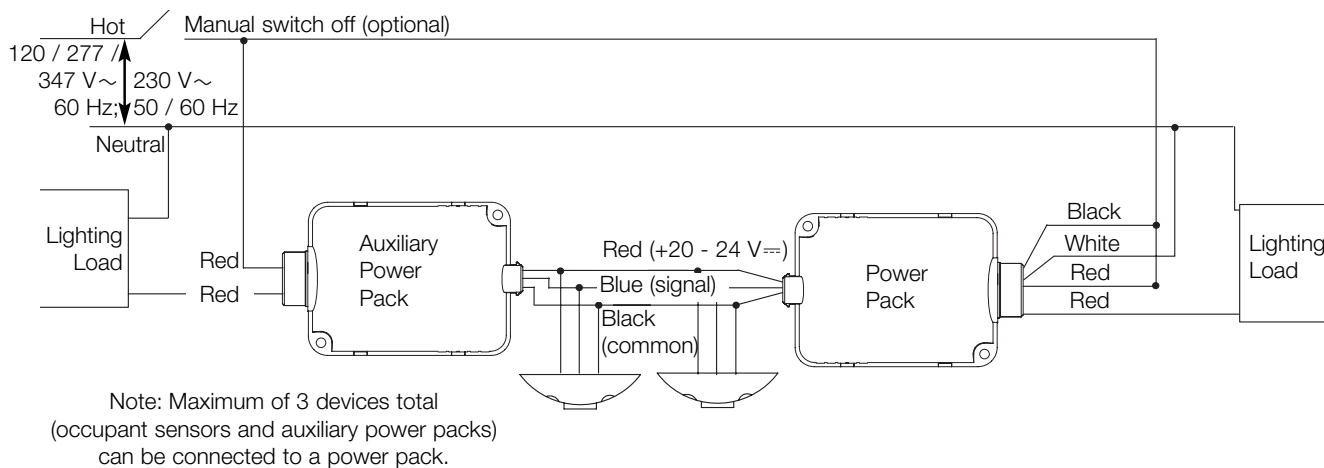
Job Number:

Wiring: Stand-Alone Control

1 to 3 Sensors with Power Pack



Switching Multiple Loads with Auxiliary Power Packs



Job Name:

Model Numbers:

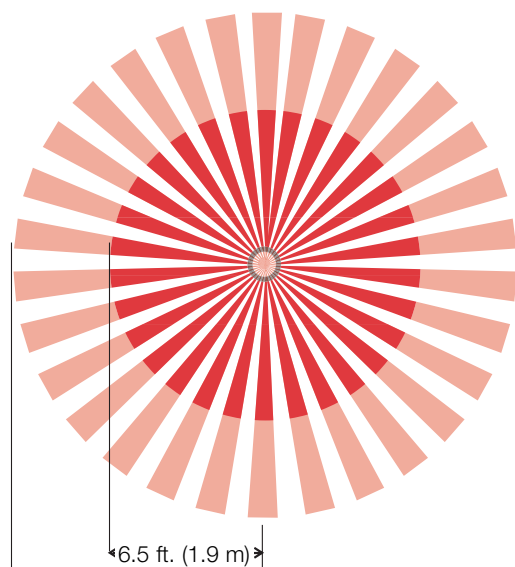
Job Number:

Installation

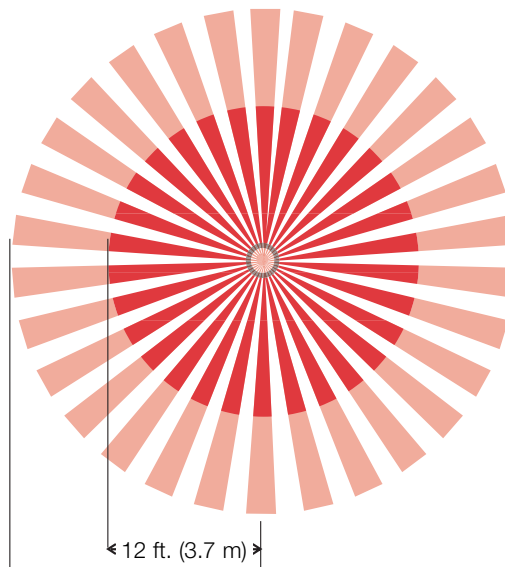
Sensor Placement

- The occupant sensor must have an unobstructed view of the room. Do not mount behind or near tall cabinets, shelves, indirect hanging fixtures, etc.
- Keep the occupant sensor away from air flow from ventilation outlets, windows, fans, etc.
- Closely follow the diagrams shown concerning major and minor motion coverage. The sensor can detect major motion (such as a person taking a half-step) at a greater distance than it can detect minor motion (such as writing or typing at a desk).
- May not detect occupancy with no significant difference between ambient and body temperatures.

Range Diagrams



LOS-CIR-450



LOS-CIR-1500



Major motion detection

Minor motion detection

Job Name:

Model Numbers:

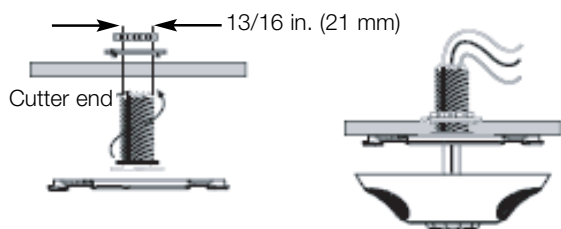
Job Number:

Installation

Mounting

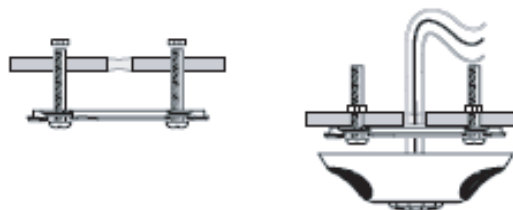
Normal Mounting

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

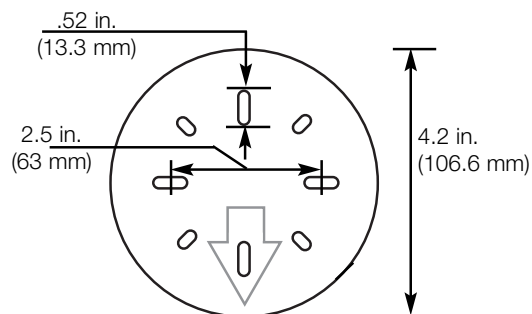


Mounting to Non-Standard Ceiling or Fixture

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



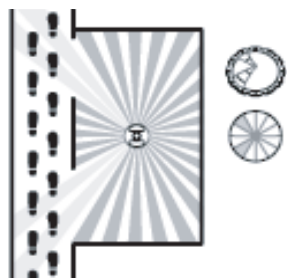
Mounting Plate Dimensions



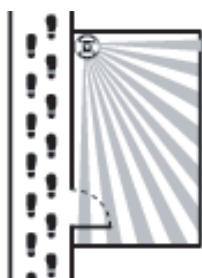
Wire Lengths

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

Using the Infrared Mask



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



Corner Ceiling Mount
(No mask needed)

Typical Mask Patterns



Conference Room Mask



180° Mask



Full Mask



Rectangular Areas



Over the Door



Specific Areas You Wish to Mask

Job Name:

Model Numbers:

Job Number:

Sensor Adjustments

Override Settings

	A	Off (Default)	On
Auto/Manual	☐	1 Automatic (Normal)	Manual on/off (Override)
Threshold	☐	2 Auto Threshold Adjustment	High Sensitivity (Low turn-on threshold)
LED Motion Indicator	☐	3 Lights indicate motion	Disable LED Indicator
Reset Learned Settings	☐	4 Retain Settings (Normal)	Erase all learned settings, Restart Learning (Toggle On)
		ON	
	B	Off	On
Strong Airflow Compensation	☐	1 Disable Compensation (Normal)	Enable Compensation
Over Doorway Installation	☐	2 No (Normal)	Yes (Use increased turn-on threshold)
Timer Adjust	☐	3 Adjust Timer Automatically	Use Manual Setting (No adjustment)
Auto Sensitivity	☐	4 Adjust Sensitivity Automatically	Adjust Sensitivity Manually
		ON	

Timer Test Mode

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



Factory Settings



12 o'clock



Full CCW

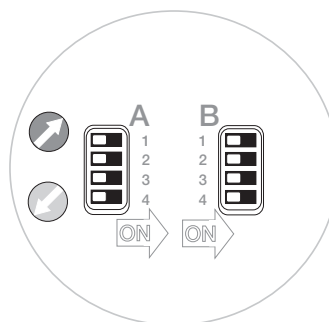
Note: The timer will remain in the 8-second test mode for 1 hour, then automatically reset to 8 minutes.

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

Factory Settings

Red: Infrared
sensitivity
75% default

Black: Timer
8 min.



Job Name:

Model Numbers:

Job Number:

MSC-100 Astronomic Time Clock

Provides time-scheduled control

Advanced holiday scheduling capability

Automatic daylight savings time adjustment

Multiple control channels

Connects to Room and House Scene Interfaces

LCD display screen



PROJECT

LOCATION/TYPE

Product Overview

Description

WattStopper's MSC-100 Astronomic Time Clock is a five-channel clock used for fully automating a Wireless Miro lighting control system. It offers simple programming, yet advanced control features. The Time Clock is used with at least one Wireless Miro Scene Interfaces.

Operation

The MSC-100 provides ON/OFF control signals based on time of day, day of week, holiday, and calculated sunrise/sunset (astronomic) time. Control signals are transmitted via hardwire connection to relay channels, giving the clock the ability to work in a range of applications from simple to complex. Clock schedules are programmed events that command channels on or off. Each schedule is assigned a number, type, time of day, channel, day, and may include other information for specific clock event operation. Schedules can be assigned to operate any combination of days or holiday types.

Programming

Programming the MSC-100 is easy. Users simply complete fill-in-the-blank prompts on the device keypad and can follow along on the LCD screen. Each clock channel can be programmed independently. All programming is securely stored in non-volatile memory.

Applications

When used in conjunction with Wireless Miro lighting controls, one MSC-100 will support connection to up to two Scene Interfaces, depending on the number of scenes required. Unused channels can be used to control third-party devices such as fountains or sprinklers.

Features

- Single date, perpetual date, perpetual day of week and perpetual Easter holidays
- 32 holidays, each up to 120 days with three holiday schedule types
- Temporary schedules that execute once then self-delete
- Repeating schedule 5 minutes to 10 hours
- 120 schedules assignable to one or more weekday or holiday
- Duration time scheduling from 1 second to 18 hours
- Continually self-adjusting astronomic control based on sunrise and sunset times
- Astronomic offset +/- 120 minutes
- Manual ON/OFF override from keypad
- Selectable 12- or 24-hour format
- Adjustable channel stagger from 1-60 seconds

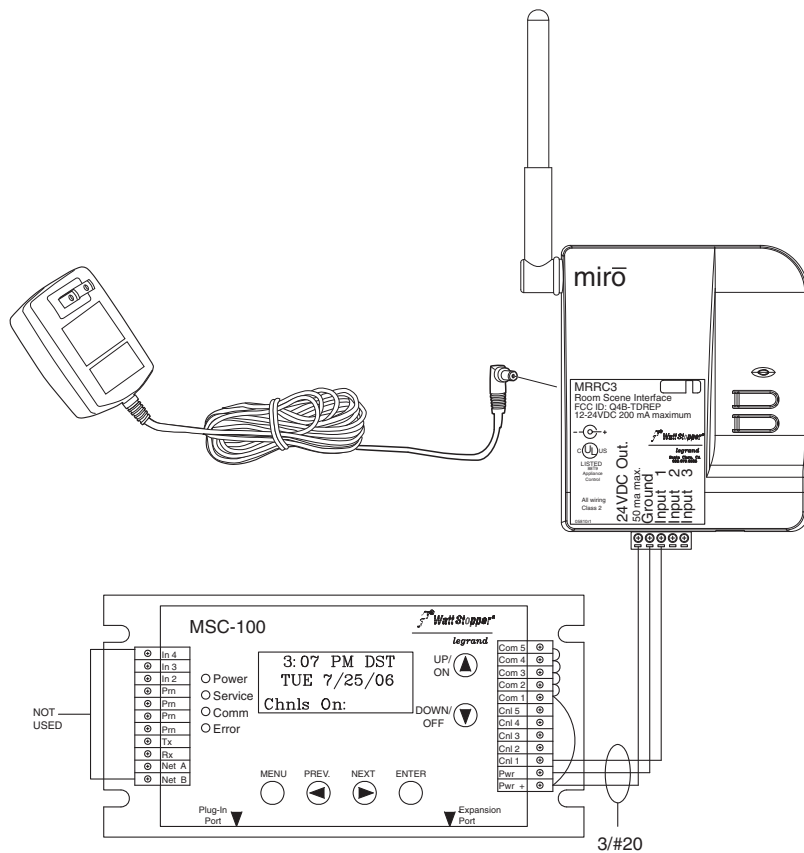


Specifications

- Input voltage: 24 VAC or 24 VDC
- Five normally open isolated relays rated 1 amp 24 VAC/VDC, assigned to channels 1-5
- Battery backed clock operation for up to 8 years
- Non-volatile program memory storage
- Power-up sequence, executes missed schedules following power outage
- Dimensions: 3.6" x 6.7" x 1.3" (91.4mm x 177.8mm x 33mm) L x W x D
- FCC compliant; CE certified
- One year warranty

System Layout & Wiring

MSC-100 Controls & Wiring



The MSC-100 Time Clock interfaces to the Wireless Miro RF network through a Miro Room or House Scene Interface. The Scene Interface supplies 24 VDC to power the Time Clock. Wiring shown is typical for one channel.

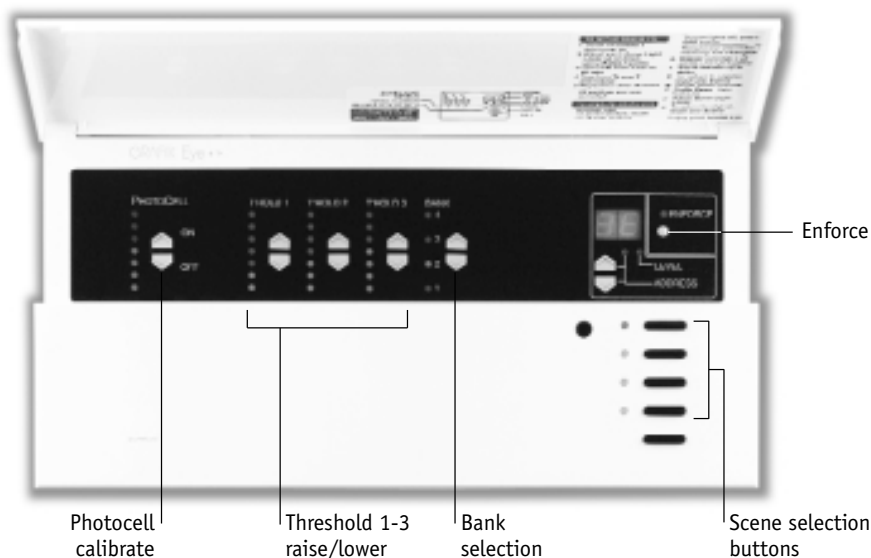
Ordering Information

Catalog No.	Product Description
☐ MSC-100	5-channel astronomic time clock
Works in conjunction with:	
Catalog No.	Description
☐ MRHC3	House Scene Interface
☐ MRRC3	Room Scene Interface

GRX-DACPI Automatic Daylighting Control

Type GR2

Cover (shown open)



DESCRIPTION

- Saves energy in spaces with windows, skylights, or doors. Automatically dims lights when sun is bright.
- Monitors ambient daylight via Lutron's MW-PS-WH photosensor or 0-10V photosensor by others.
- Automatically selects scenes in Control Units based on the amount of daylight available.
- Helps maximize energy savings with "enforce" mode – automatic control overrides lighting set by occupants.
- Eliminates "passing cloud" effect with a two-minute "range qualification" timer.
- Works with GRX-3000 and GRX-4000 Control Units. Can be set up to select scenes in just one Control Unit or a group of up to eight Control Units.

Thresholds Define Ranges. Ranges Call Scenes.

The GRX-DACPI provides four banks. Each bank

- Lets you enter three thresholds.
- Automatically calls the four scenes shown below.

You enter thresholds that define ranges:		Range 1 0-25%		Range 2 26-50%		Range 3 51-75%		Range 4 76-100%	
Each range calls a scene:		Threshold 1 = 25%		Threshold 2 = 50%		Threshold 3 = 75%			
Bank 1	Scene 1	Threshold 1 = 25%	Scene 2	Threshold 2 = 50%	Scene 3	Threshold 3 = 75%	Scene 4		
Bank 2	Scene 5		Scene 6		Scene 7		Scene 8		
Bank 3	Scene 9		Scene 10		Scene 11		Scene 12		
Bank 4	Scene 13		Scene 14		Scene 15		Scene 16		

HOW IT WORKS

- In the GRX-DACPI Daylighting Control, you set up thresholds to define different ranges of daylight.
- In the Control Unit(s), you set up scenes to complement these levels.
- The GRX-DACPI monitors ambient light, automatically selecting scenes as daylight levels cross thresholds.

The GRX-DACPI lets you set up four "banks" of thresholds and scenes.

- You can set up three different thresholds for each bank.
- You use the bank select keys to select which bank the GRX-DACPI uses.
- The GRX-DACPI automatically selects scenes based on the bank selected and the amount of daylight available.

This gives you 12 different thresholds that call 16 different Control Unit lighting scenes. So you can create thresholds and scenes for different times of the day (morning vs. afternoon) or year (winter vs. spring).

JOB NAME:	MODEL NUMBERS:
JOB NUMBER:	

FUNCTIONS

Buttons and Settings	What They Do								
Scene selection buttons	Select scenes • 1 to 4 with bank 1 • 5 to 8 with bank 2 • 9 to 12 with bank 3 • 13 to 16 with bank 4								
Bank selection	• Select which bank the GRX-DACPI uses. • LED 1 lights for bank 1, LED 2 for bank 2...								
Threshold raise/lower	Used to setup 3 thresholds for each bank. Each threshold must be equal to or lower than the next threshold. An example is: <table border="1"> <thead> <tr> <th>Threshold</th><th>Default Settings:</th></tr> </thead> <tbody> <tr> <td>1</td><td>0-25%</td></tr> <tr> <td>2</td><td>25-50%</td></tr> <tr> <td>3</td><td>50-75%</td></tr> </tbody> </table>	Threshold	Default Settings:	1	0-25%	2	25-50%	3	50-75%
Threshold	Default Settings:								
1	0-25%								
2	25-50%								
3	50-75%								
Photocell calibrate button	Calibrates the photocell connected to the GRX-DACPI.								
Enforce toggle button and LED	Forces the GRX-DACPI to re-select the appropriate scene every 5 minutes – even if daylight levels stay the same. LED lights when enforce mode is on.								

SPECIFICATIONS

Power

Operating voltage: Low-voltage Class 2 (PELV), 12VDC to 24VFW.

Automatic Daylighting Control

- Automatically selects preset lighting scenes in response to ambient daylight.
- Provides four “banks”. Each bank provides three thresholds (levels of ambient daylight) and four scenes.
- Allows photosensor input to override manual scene selection.
- Has “Range qualification” timer. When changes in daylight cause a scene change, the GRX-DACPI waits 2 minutes before another “automatic” scene change. (Scene selection buttons work immediately.)

Photosensor Input

- Accepts
 - Up to three MW-PS-WH photosensors wired in parallel.
 - One 0-10V photosensor by others.
- Averages readings from three photosensors wired in parallel.
- Provides push-button photosensor calibration.

Key Design Features

- Meets IEC 801-2. Tested to withstand 15kV electrostatic discharge without damage or memory loss.
- Has faceplate that snaps on with no visible means of attachment.

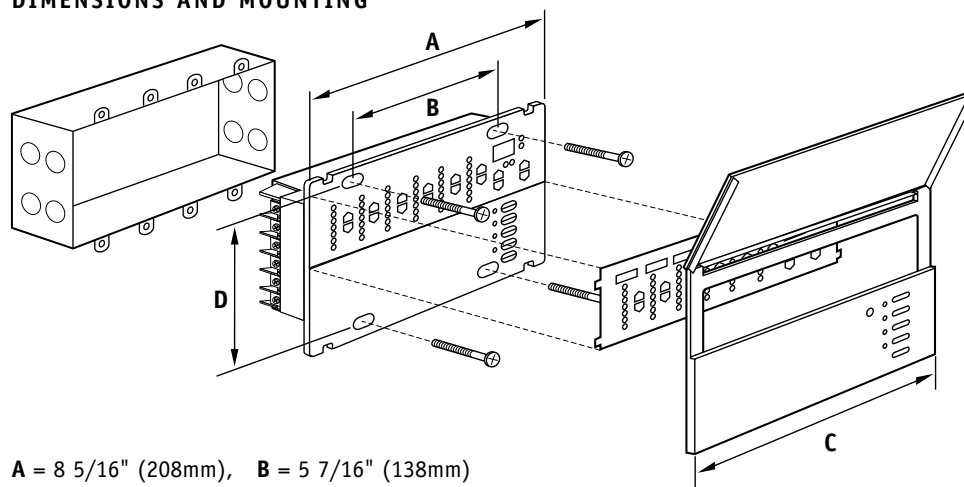
System Communications and Capacity

Low-voltage Class 2 (PELV) wiring connects the GRX-DACPI to Control Units and other components.

Environment

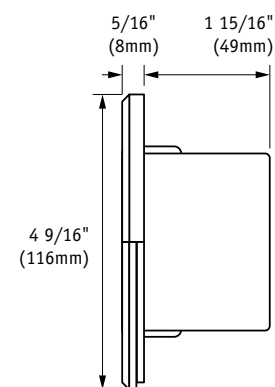
32-104°F (0-40°C). 90% non-condensing relative humidity.

DIMENSIONS AND MOUNTING



A = 8 5/16" (208mm), B = 5 7/16" (138mm)
C = 8.94" (227mm), D = 3 15/16 (85mm)

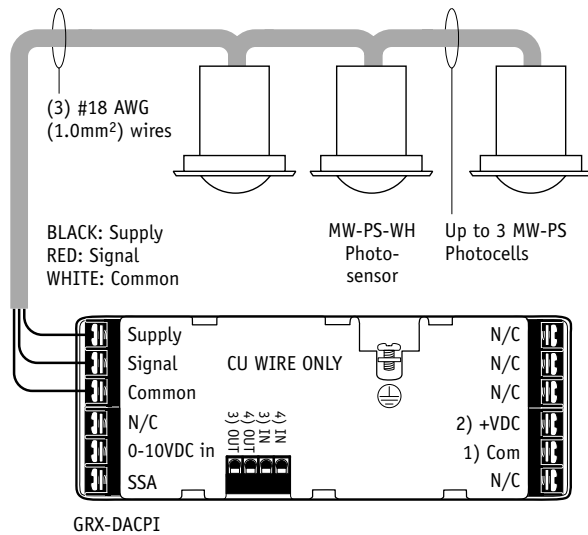
Side View



JOB NAME:	MODEL NUMBERS:
JOB NUMBER:	

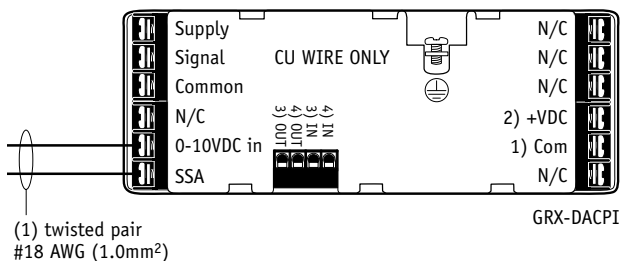
WIRING FOR LUTRON MW-PS-WH PHOTOCELL

Each terminal accepts one #18 AWG (1.0mm²) wire.



WIRING FOR 0-10VDC PHOTOCELL BY OTHERS

- 0-10VDC input from photo measurement equipment by other manufacturers.
- Each terminal accepts one #12 AWG (2.5mm²) wire.



LOW-VOLTAGE CLASS 2 (PELV) WIRING

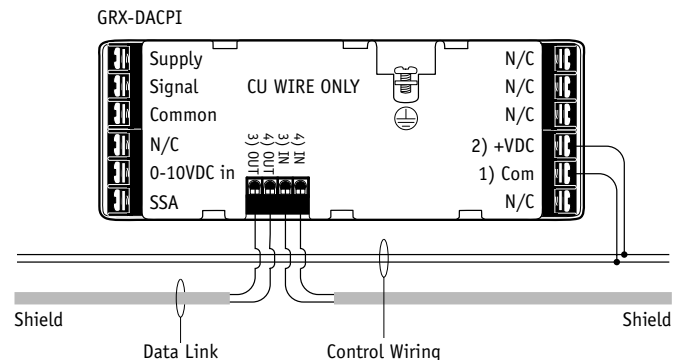
- Make daisy-chain connections to terminals on back of GRX-DACPI.
- Connect Drain/Shield as shown.
 - Do not connect to Ground (Earth) or Wallstation.
 - Connect the bare drain wires and cut off the outside shield.

Make all connections in the wallbox. Or in a switchbox or junction box with a maximum wire length of 8 feet (2.5m) from the link to the GRX-DACPI.

- Terminals 1: Common and 2: +VDC each accept two #12 AWG (2.5mm²) conductors.
- Terminals for 3 and 4 In and Out each accept one #18 AWG (1.0mm²) wire.

Terminal Connections

Terminals	When used with GRX-3000 Control Units	When used with GRX-4000 Control Units
1: Common	(2) #18 AWG (1.0mm ²) for control wiring	(2) #12 AWG (2.5mm ²) for control wiring
2: +VDC		
4: IN	(1) shielded, twisted pair #18 AWG (1.0mm ²) for data link	(1) shielded, twisted pair #18 AWG (1.0mm ²) for data link
3: IN		
4: OUT		
3: OUT		



JOB NAME:	MODEL NUMBERS:
JOB NUMBER:	

LUT-ELI-3PH Emergency Lighting Interface

Type EL1



Description

- The LUT-ELI-3PH is UL924 Listed as “Emergency Lighting and Power Equipment.”
- The LUT-ELI-3PH is to be used in conjunction with Lutron *GRAFIK* Systems GP, LP dimming panels, XP switching panels (Circuit Selector), *RadioTouch*® Controllers, *EcoSystem*® Bus Supplies, *Quantum*® Bus Supplies, XPS, and LCP Controllers.
- The LUT-ELI-3PH senses the normal (non-essential) line voltage on all three phases (3PH) of normal power. When one or more phases of power are lost, the LUT-ELI-3PH will send a signal to the *RadioTouch* Controller, Circuit Selector, *EcoSystem* Bus Supply, *Quantum* Bus Supply, LCP Controller, or XPS Controller with emergency (essential) power, causing it to enter the emergency lighting mode. Any lights controlled by these devices will go to the emergency light level setting (factory set to 100% intensity). When normal power is restored, the lights will return to their previous intensities.
- The interface mounts to a standard 4 x 4 in (102 x 102 mm) junction box. It is powered by the *RadioTouch*, GP, XP, LP, LCP, or XPS panel's 24 V $\overline{=}$ supply. The interface can detect 100 to 347 V $\sim$ 50/60 Hz.
- For use with an *EcoSystem* or *Quantum* Bus Supply, a separate 24 V $\overline{=}$ power supply must be used.

Job Name:

Model Numbers:

Job Number:

Specifications

Power

- Sense voltage input to the LUT-ELI-3PH **must** be from the **Normal** (Non Essential) power source.
- Sense voltage range: 100-347 V $\sim$ 50/60 Hz, 3 Phase.
- Proper short-circuit and over-current protection must be provided at the distribution panel. A 20 A maximum circuit breaker may be used for the installation.

Standards

- UL 924 Listed

Inputs

- 2 inputs for a Fire Alarm Control Panel (FACP). A normally open or normally closed dry contact input on the FACP inputs will activate the emergency mode.

Status Light

- Pilot light indicates the phase status. Pilot light “ON” is normal mode, “OFF” is emergency mode.

Test Switch

- A test switch is provided to perform a functional test of the system by simulating an emergency situation.

System Communications and Capacity

- May be added to an existing Lutron system.
- One LUT-ELI-3PH may be used with up to 32 Circuit Selectors, 32 XPS/LCP Controllers, 100 RadioTouch® controllers, or 20 EcoSystem® Bus Supplies.
- Only 1 Quantum® Bus Supply per hub needs to be connected per LUT-ELI-3PH. There can be up to 5 *Quantum* hubs connected to one LUT-ELI-3PH.

Environment

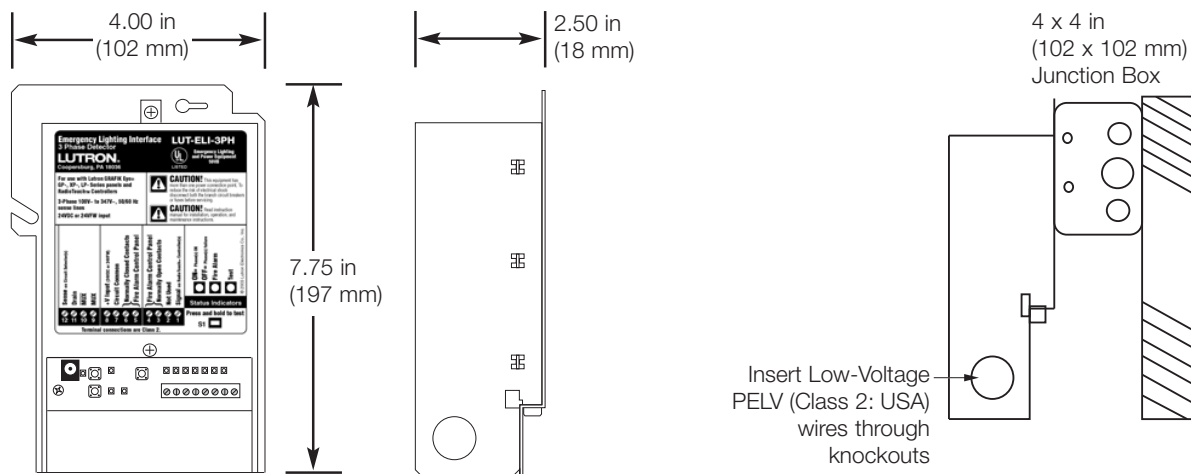
32-104 °F (0-40 °C). Relative humidity less than 90% non-condensing.

Job Name:

Model Numbers:

Job Number:

Dimensions and Mounting



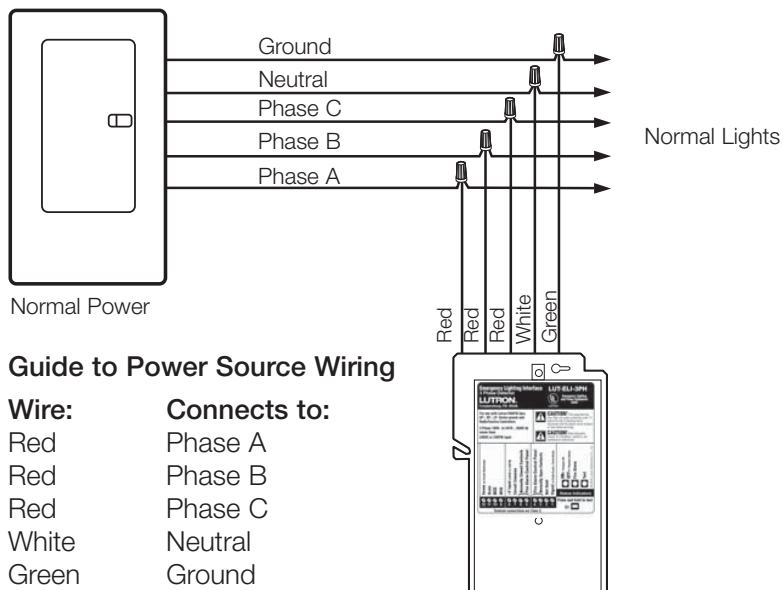
Job Name:

Model Numbers:

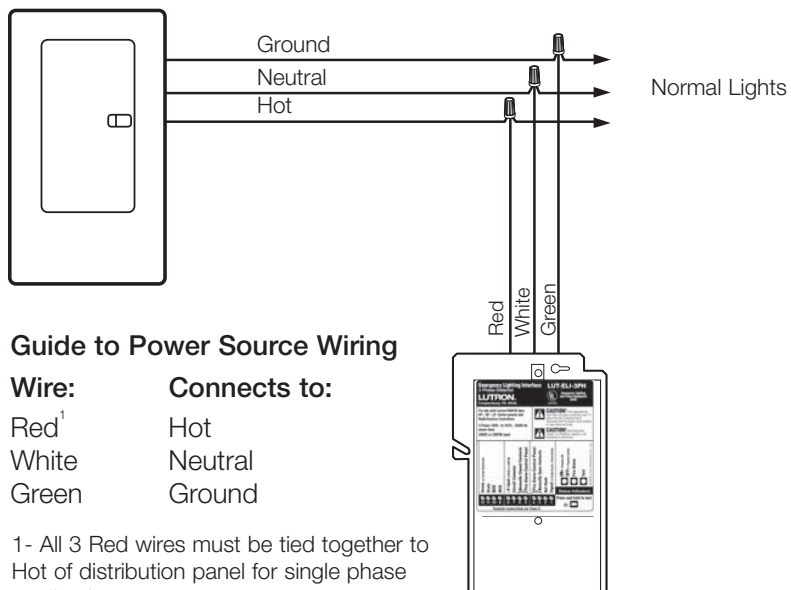
Job Number:

Line Voltage Wiring

3-Phase Diagram



Single Phase Diagram

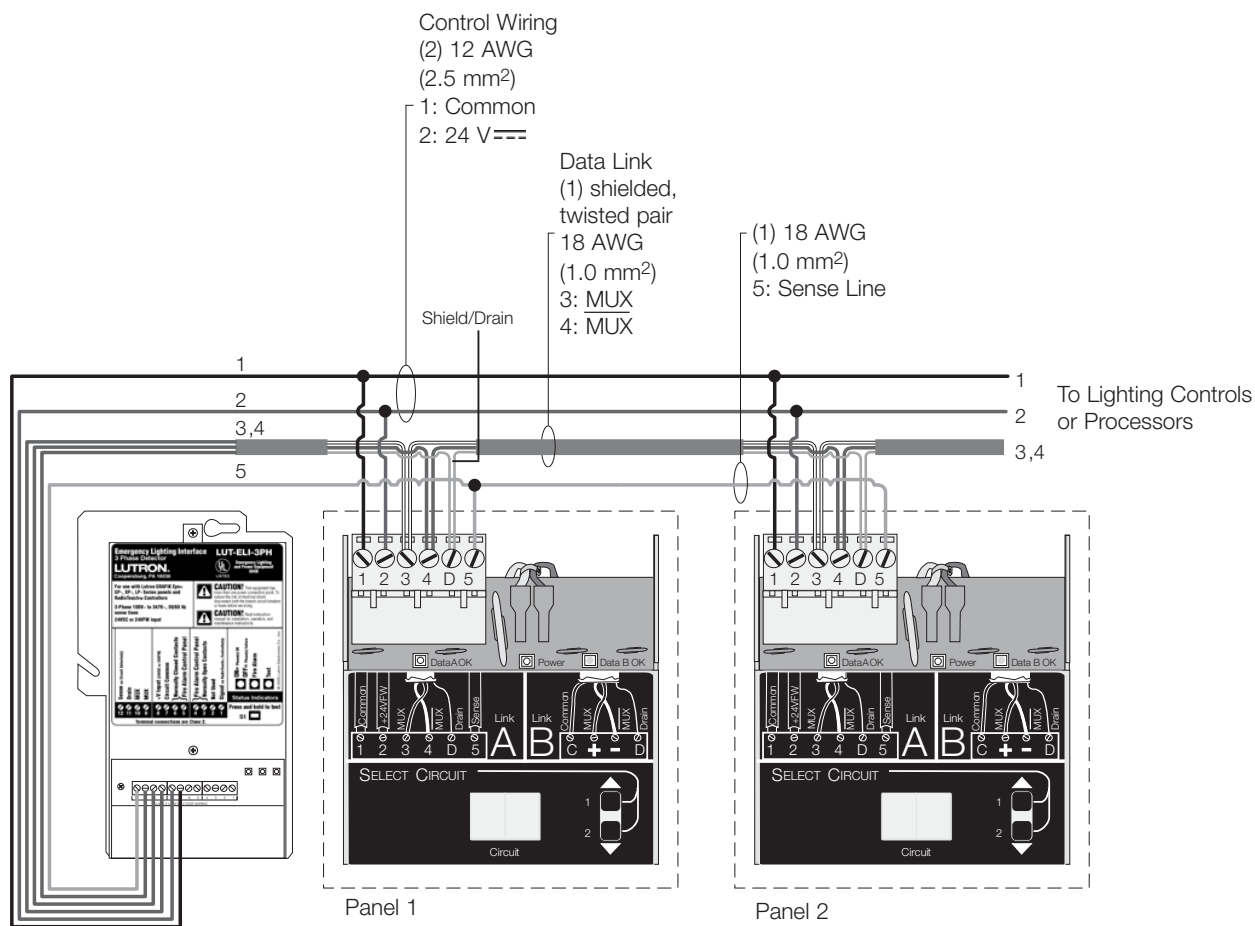


Job Name:

Model Numbers:

Job Number:

Low-Voltage PELV (Class 2: USA) Wiring GRAFIK Systems GP, XP, and LP Panels



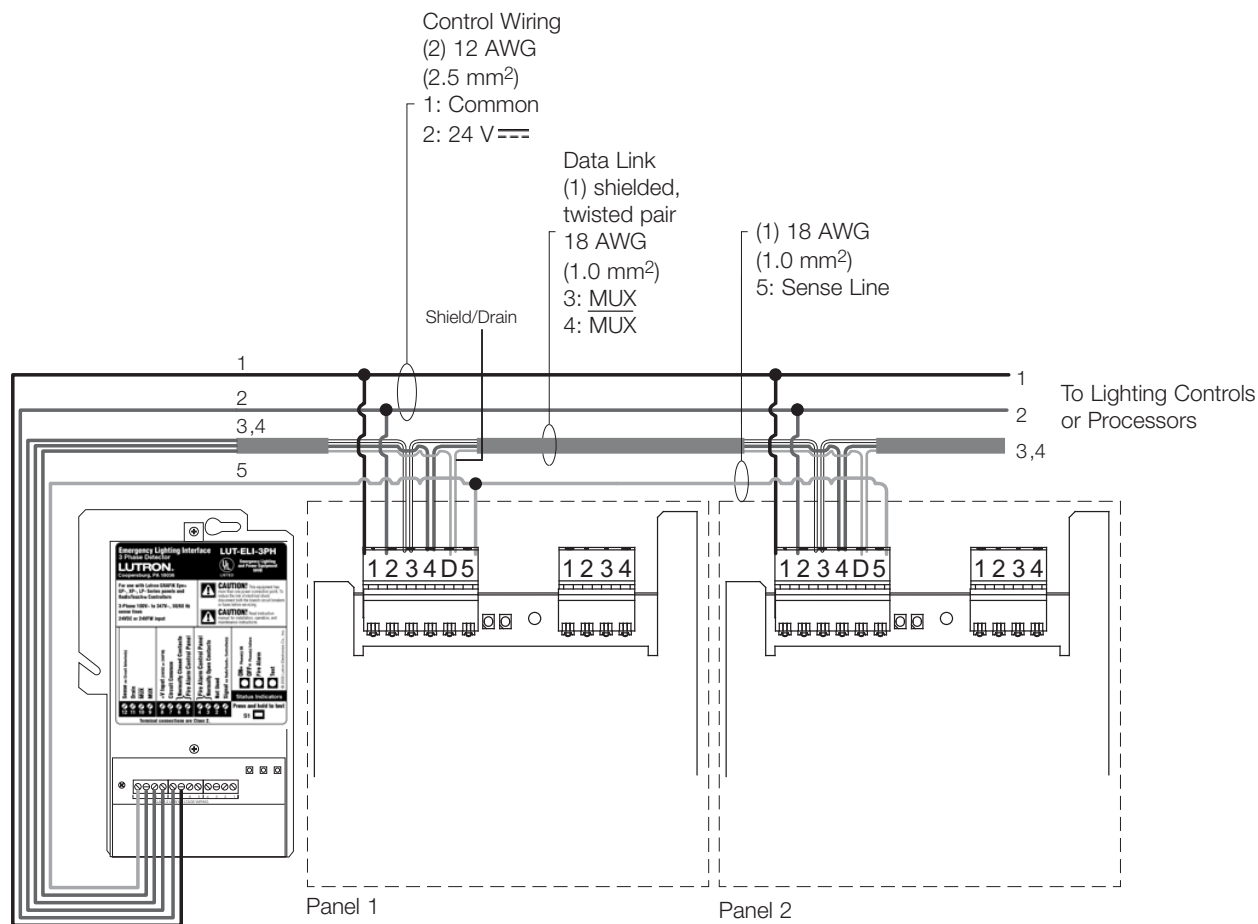
- One LUT-ELI-3PH may be connected in parallel with up to 32 Circuit Selectors.
- LUT-ELI-3PH may be placed anywhere on the power panel link.
- Switch position SW6 on the Circuit Selector must be in the right-most position on all Emergency Panels.
- The LUT-ELI-3PH 24 V $\overline{\overline{=}}$ input must always be connected to at least one of the Emergency Panels.

Job Name:

Model Numbers:

Job Number:

Low-Voltage PELV (Class 2: USA) Wiring GRAFIK Systems LCP and XPS Panels



- One LUT-ELI-3PH may be connected in parallel with up to 32 Circuit Selectors.
- LUT-ELI-3PH may be placed anywhere on the power panel link.
- Switch position SW6 on the Circuit Selector must be in the right-most position on all Emergency Panels.
- The LUT-ELI-3PH 24 VDC input must always be connected to at least one of the Emergency Panels.

Job Name:

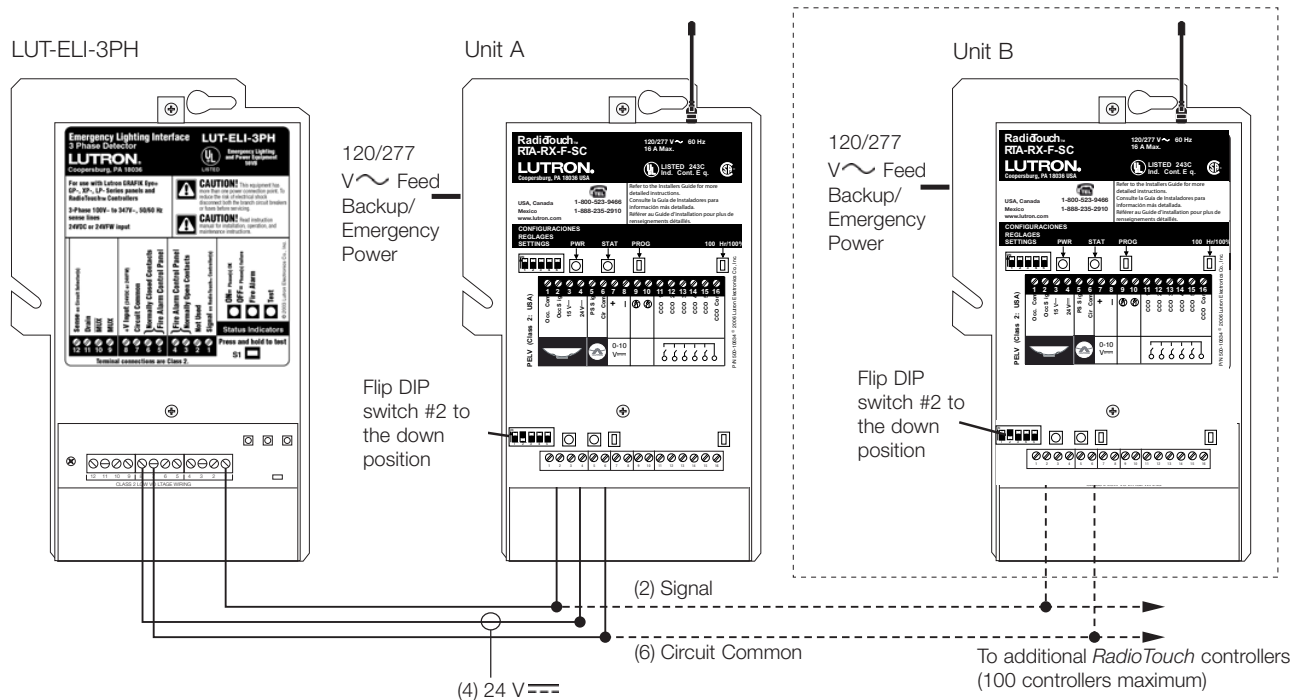
Model Numbers:

Job Number:

Low-Voltage PELV (Class 2: USA) Wiring RadioTouch®

Available power from this unit for
photosensors must be derated to
15 mA.

Additional *RadioTouch* controller for
Backup/Emergency Lights



- One LUT-ELI-3PH may be connected in parallel with up to 100 *RadioTouch* controllers.
- DIP switch #2 on the *RadioTouch* controller must be in the down position.
- When wiring a *RadioTouch* controller for emergency lighting it cannot be controlled by occupant sensors.

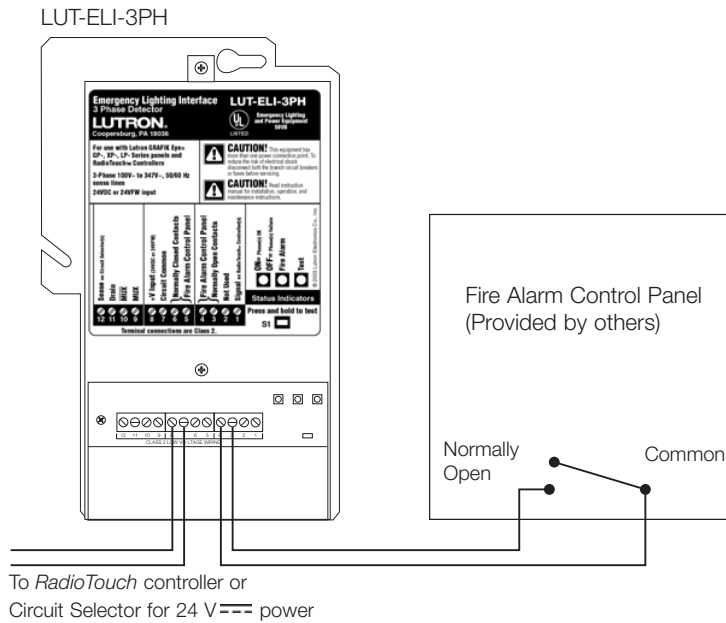
Job Name:

Model Numbers:

Job Number:

Low-Voltage PELV (Class 2: USA) Wiring to Fire Alarm Control Panel (FACP)

Normally Open FACP Input



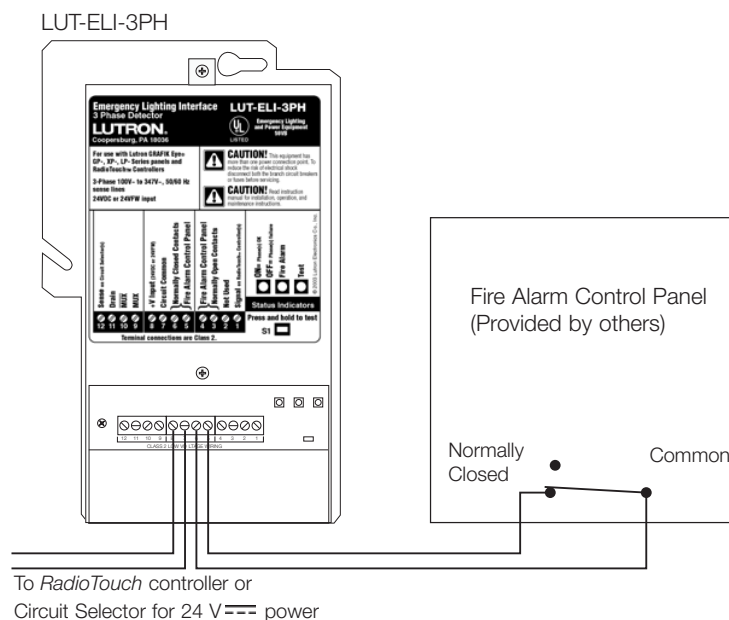
Important

Use only with normally open (terminals 3 and 4) or normally closed (terminals 5 and 6) dry contact closure. When the proper contact state is triggered, it must be maintained for the LUT-ELI-3PH to go into Emergency Mode. Once the contact is released, the LUT-ELI-3PH will return the *GRAFIK* Systems GP, LP, XP panels, XPS, LCP, RadioTouch® controller, EcoSystem Bus Supply, or Quantum Bus Supply back to Normal operation mode.

The LUT-ELI-3PH will have a factory installed jumper to provide the normally closed input signal for the supervisory circuit when a normally closed FACP input is not provided.

Consult your Fire Alarm Control Panel's instruction manual before connecting to the LUT-ELI-3PH.

Supervisory Circuit (Normally Closed FACP Input)



Danger - Do not connect any voltage source to the FACP inputs on the LUT-ELI-3PH. If voltage is provided by the FACP and connected to the LUT-ELI-3PH, it can damage the LUT-ELI-3PH.

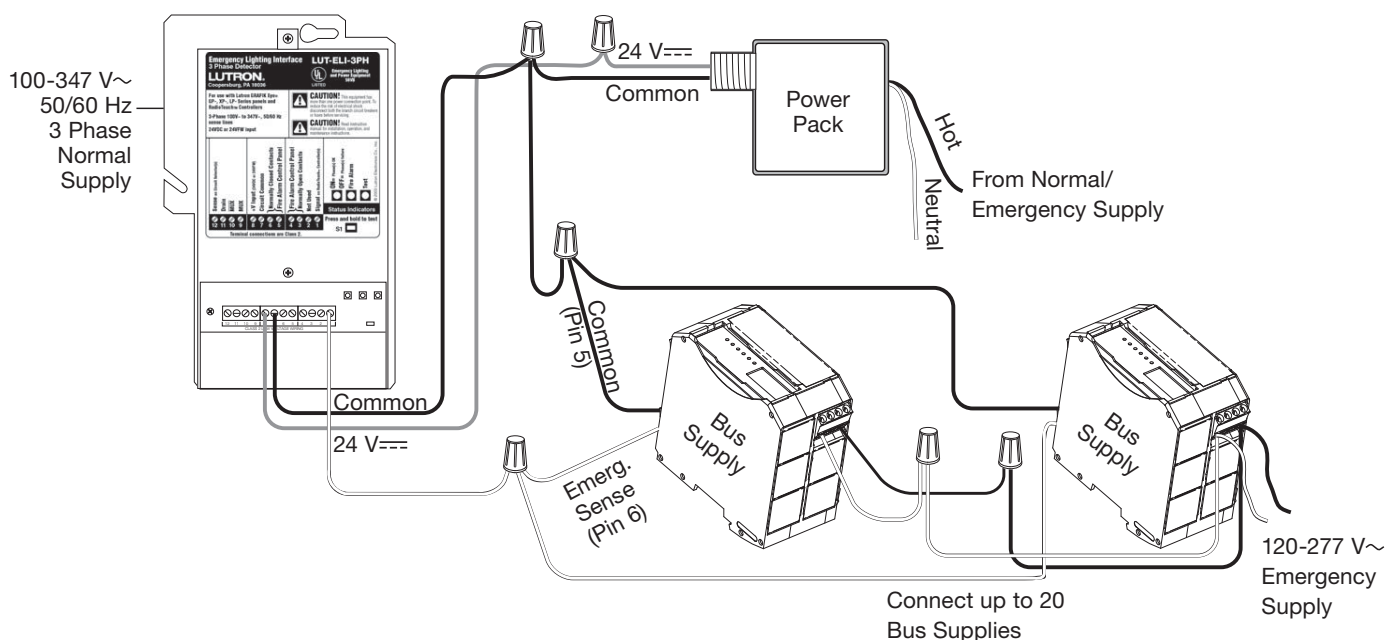
Job Name:

Model Numbers:

Job Number:

UL924 Compliance with EcoSystem®

Using a LUT-ELI-3PH with a *EcoSystem* Bus Supply ensures that the system is compliant with UL924. Follow the wiring diagram in the LUT-ELI-3PH for mains wiring. Use the diagram below to complete the installation. There can be up to 20 Bus Supplies connected to one LUT-ELI-3PH.



Wiring Summary:

- Wire Power Pack Red Wire (+24 V---) to LUT-ELI-3PH terminal 8 (V+)
- Wire Power Pack Black Wire (Common) to LUT-ELI-3PH terminal 7 (Circuit Common) and to *EcoSystem* Bus Supply Terminal 5 (Common)
- Wire Signal wire from LUT-ELI-3PH (terminal 1) to *EcoSystem* Bus Supply terminal 6 (CCI-Emergency)

Note: When normal power fails and the LUT-ELI trips, the *EcoSystem* Bus Supply stops powering the *EcoSystem* bus, and all ballasts will turn on to their emergency light level.

Note: The LUT-ELI-3PH includes panic closure inputs as well. Consult the LUT-ELI-3PH instructions for wiring details.

Job Name:

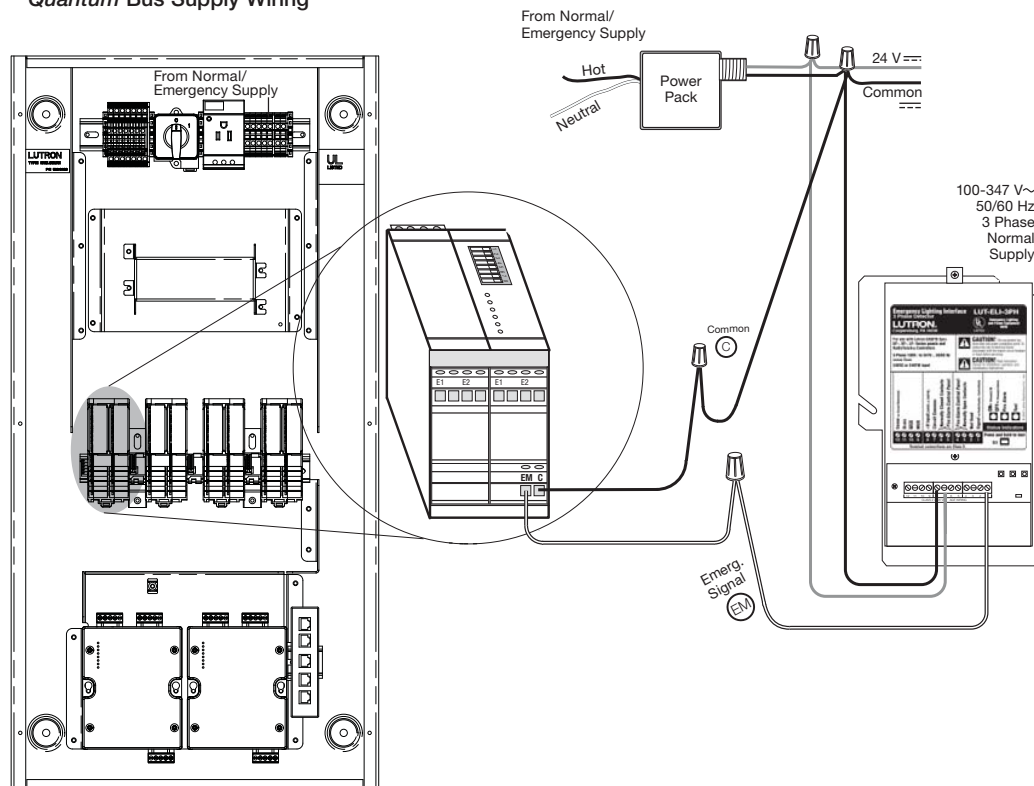
Model Numbers:

Job Number:

UL924 Compliance with Quantum®

Using a LUT-ELI-3PH with a *Quantum* Bus Supply ensures that the system is compliant with UL924. Follow the wiring diagram in the LUT-ELI-3PH for mains wiring. Use the diagram below to complete the installation. Only 1 Bus Supply per hub needs to be connected per LUT-ELI-3PH. There can be up to 5 *Quantum* hubs connected to one LUT-ELI-3PH.

Quantum Bus Supply Wiring



Wiring Summary:

- Wire Power Pack Red Wire (+24 VDC) to LUT-ELI-3PH terminal 8 (V+)
- Wire Power Pack Black Wire (Common) to LUT-ELI-3PH terminal 7 (Circuit Common) and to *Quantum* Bus Supply Terminal 5 (Common)
- Wire Signal wire from LUT ELI-3PH (terminal 1) to *Quantum* Bus Supply terminal 6 (CCI-Emergency)

Note: When normal power fails and the LUT-ELI-3PH trips, the *Quantum* Bus Supply stops powering the *EcoSystem* bus, and all ballasts will turn on to their emergency light level.

Note: The LUT-ELI-3PH includes panic closure inputs as well. Consult the LUT-ELI-3PH instructions for wiring details.

Job Name:	Model Numbers:
Job Number:	

microPS™ Daylight Sensor

Type PS



Description

- Provides daylight harvesting capability.
- May be used with the Digital microWATT® Lighting Zone Controller, GRX/OMX-DACPI, or RadioTouch Controller.
- Allows controllers to automatically dim lights when available daylight is high and brighten lights when daylight is low in order to maintain a specific light level in the space.
- May be calibrated for daylight sensitivity.
- Mounts easily on any ceiling tile with one 2" diameter hole.

Specifications

Power

Low-voltage Class 2

Operating Voltage: 24 V Direct Current.

Key Design Features

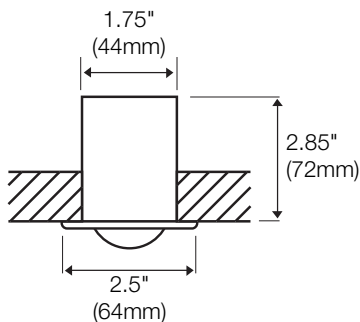
Meets IEC 801-2. Tested to withstand 15kV electro-static discharge without damage or memory loss.

Environment

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

Delivery

Ships in 3-4 weeks.



2" (50mm) diameter hole
required for installation

Job Name:

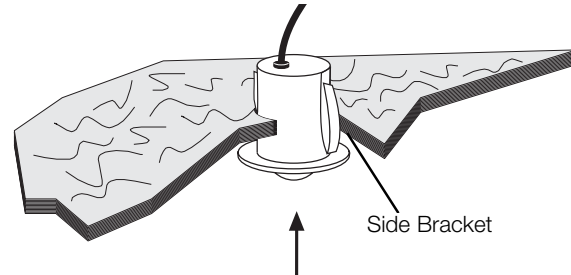
Model Numbers:

Job Number:

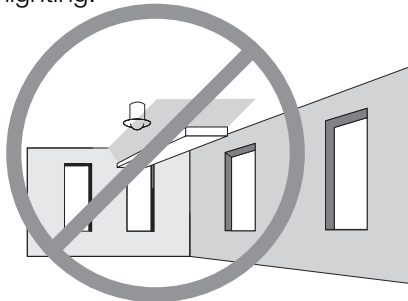
Mounting

- Determine the proper mounting location for the Daylight Sensor using the adjacent diagrams.
- The notch on the Daylight Sensor defines the viewing direction.
- Place Daylight Sensor so its viewing area does not extend out of the window.
- Do not position Daylight Sensor in the well of a skylight or above indirect lighting fixtures.
- Ensure that the view of the Daylight Sensor is not obstructed.

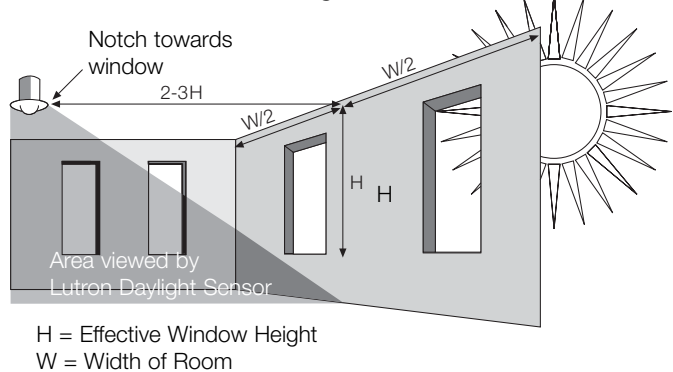
Cut an approximate 2 in. (5.0 cm) diameter hole in the ceiling tile and install the Daylight Sensor by compressing the bracket sides and fully inserting the sensor into the hole. The bracket sides will hold the Daylight Sensor in place.



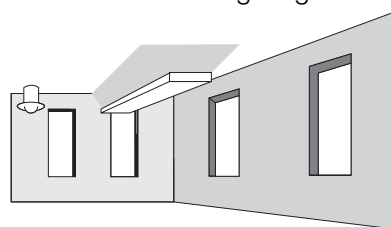
Do not place Daylight Sensor above indirect lighting.



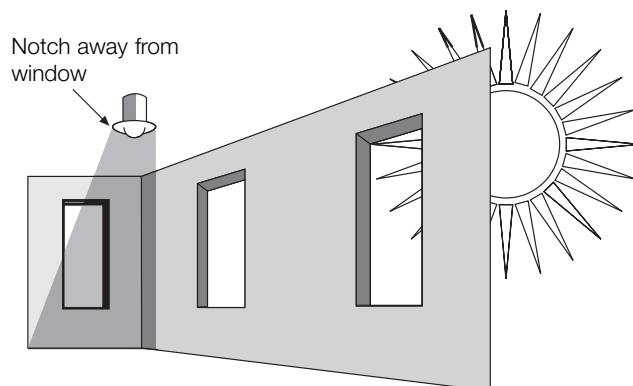
MW-PS location for average-size areas



Move the Daylight Sensor to a location away from the lighting or lower it below the lighting fixture.



MW-PS location for narrow-size areas (e.g. corridors, private offices)



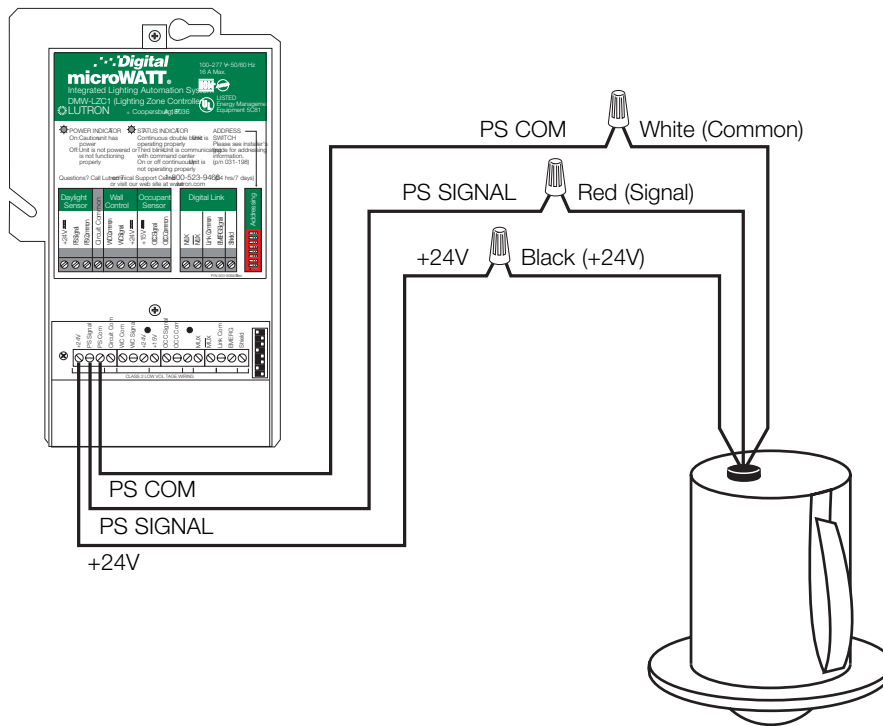
Wiring to Digital microWATT® Lighting Zone Controller

- Ensure that the supply breaker to the Digital microWATT Lighting Zone Controller is OFF.
- Connect the three conductors to the three MW-PS wires as shown.
- Connect the three conductors to the corresponding terminals on the Digital microWATT Lighting Zone Controller.



Caution – Observe all local and national electrical codes and safety standards.

Note: Each Digital microWATT Lighting Zone Controller must have its own Daylight Sensor. Multiple Daylight Sensors may not be used with a Digital microWATT Lighting Controller nor can multiple Digital microWATT Lighting Controllers share a Daylight Sensor.

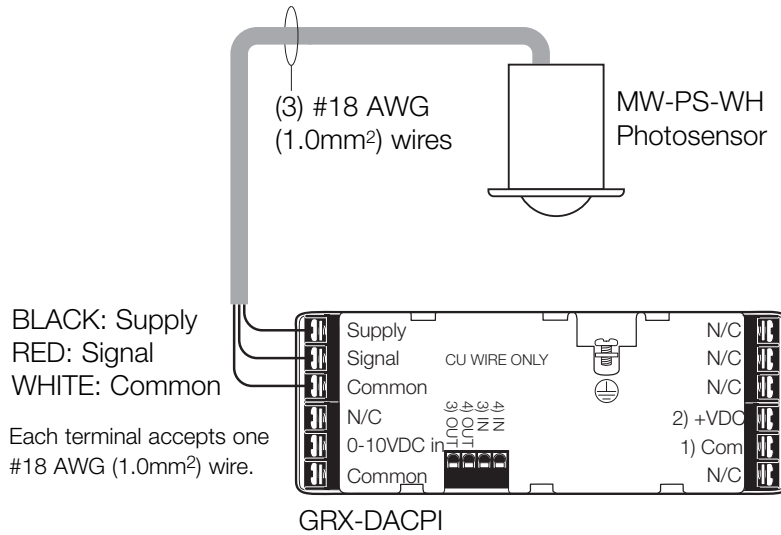


Job Name:

Model Numbers:

Job Number:

Wiring to GRX-DACPI



Job Name:

Model Numbers:

Job Number:

Panelboards
Pow-R-Line 2a

22.2-1

General Description — Pow-R-Line 2a

Pow-R-Line 2a



Pow-R-Line 2a

General Description

Panelboard Ratings

Voltage:

- 240 Vac maximum.
- 480Y/277 Vac maximum.

Note: PRL2a panelboards are suitable for use on 3-phase, 3-wire applications when derived from a 3-phase, 4-wire 480Y/277 Vac service where the neutral is not brought to the panelboard. For 3-phase, 3-wire 480 Vac Delta services use a PRL3a panelboard.

- 250 Vdc maximum.

Main Lugs:

- 100 – 400 amperes.

Main Breakers:

- 100 – 400 amperes.

Branch Breakers:

- 15 – 100 amperes (bolt-on).

Short Circuit Current Ratings (Symmetrical)

- 240 Vac: 65 kA fully rated.
- 240 Vac: 100 – 200 kA series rated.
- 480Y/277 Vac: 14 kA fully rated.
- 480Y/277 Vac: 22 – 150 kA series rated.
- 250 Vdc: 10 kA and 14 kA fully rated.

Service

- 3-phase, 4-wire 208Y/120 V and 240/120 V Delta and 480Y/277 V.
- Single-phase, 3-wire 120/240 V.
- Single-phase, 2-wire 120 V.
- 3-phase, 3-wire 208 and 240 V.
- 2-wire 125 Vdc.
- 2-wire 250 Vdc.

Suitable for service entrance applications when specified.

Mains

For available mains, refer to **Table 22.2-1**.

The GHB main breaker is horizontally mounted, same as branch breakers. All other main breakers are vertically mounted.

Branch Circuits

For available branch devices, refer to **Table 22.2-2**.

Main Lugs Only

The short circuit rating of the MLO assembled panelboard will be fully rated based upon the lowest rated branch device or may be series rated with an approved upstream device.

Main lugs only ampere ratings: 100, 225 and 400.

Main Circuit Breakers

The short circuit rating shown is that of the main breaker only. The short circuit rating of the assembled panelboard is the rating of the lowest fully rated main or branch device or the rating of an approved series rated combination.

Table 22.2-1. Main Circuit Breakers

Breaker Frame (Amperes)	Breaker Type	Interrupting Rating (kA Symmetrical)		
		240 V	480Y/277 V	125/250 Vdc
100	GHB ①	65	14	14
100	EHD	18	14	10
150	FDB	18	14	10
225	FD	65	35	10
225	HFD	100	65	22
225	FDC	200	100	22
225	ED	65	—	—
250	EDH	100	—	—
250	EDC	200	—	—
250	JD	65	35	10
250	HJD	100	65	22
250	JDC	200	100	22
400	DK	65	—	10
400	KD	65	35	10
400	HKD	100	65	22
400	KDC	200	100	22

① At 480 V, use on 480Y/277 V systems only.

Table 22.2-2. Branch Circuit Breakers

Breaker Type	Ampere Rating	Number of Poles	Interrupting Rating (kA Symmetrical)				
			120 V	240 V	277 V	480Y/277 V	125/250 Vdc
GHB ②	15 – 100	1	65	—	14	—	14
GHB ②	15 – 100	2, 3	—	65	—	14	14
GHQ	15 – 20	1	65	—	14	—	—
HGHB	15 – 30	1	65	—	25	—	—
GHQRSP ②③	15 – 20	1, 2	65	65	14	14	—
GHBS ③	15 – 30	1, 2	65	65	14	14	—
GHBGFEP	15 – 60	1	—	—	14	—	—

② At 480 V, use on 480Y/277 Vac systems only.

③ Solenoid operated breaker.

Series Rated Combinations

Refer to series rating tables beginning on **Page 22.0-11** for the approved series rated combinations available for the branch circuit breakers listed in **Table 22.2-2**.

Technical Data

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 22.2-3. Sub-Feed Lugs (Main Lugs Only)

Amperes	Panel Height Addition
100	0 Inches (0 mm)
225	0 Inches (0 mm)

Table 22.2-4. Through-Feed Lugs

Amperes	Information
100	See Table 22.2-6
225	See Table 22.2-6
400	See Table 22.2-6

Table 22.2-5. Sub-Feed Breakers
(One Per Panel)

Ampere Rating	Breaker Type	Interrupting Rating (kA Symmetrical)	
		240 V	480Y/277 V
150	FDB	18	14
225	FD	65	35
225	HFD	100	65
225	FDC	200	100
225	ED	65	—
225	EDH	100	—
225	EDC	200	—
250	JD	65	35
250	HJD	100	65
250	JDC	200	100
400	KD	65	35
400	HKD	100	65
400	KDC	200	100

Shunt Trips

Shunt trips are available on breakers. GHB breakers with shunt trips require 3-pole frame.

Ground Bar

Standard bolted in box. Aluminum is standard. Copper is available as an option.

Enclosures

Types 1, 12, 3R, 4/4X.

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 22.2-6**.

Instructions

- Using description on the required panelboard, 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 (GHB Type), use main lug table, include space in branch section for mains.

Table 22.2-6. Type 1 Panelboards — Dimensions in Inches (mm)

Ampere Rating of Mains	Main Breaker Type Mounting Position	Maximum Number of Branch Circuits Including Provisions	Box Dimensions ①②		
			Height	Width	Depth
100 A Panelboards					
100 A ③ Main Lugs or Main Breaker	EHD, FDB, FD, HFD, FDC Vertical	18	36 (914.4)	20 (508.0)	5.75 (146.1)
		30	48 (1219.2)	20 (508.0)	5.75 (146.1)
		42	48 (1219.2)	20 (508.0)	5.75 (146.1)
		48	60 (1524.0)	20 (508.0)	5.75 (146.1)
100 A ③ Main Lugs or Main Breaker with 100 A Through-Feed Lugs or Sub-Feed Breaker	EHD, FDB, FD, HFD, FDC Vertical	18	48 (1219.2)	20 (508.0)	5.75 (146.1)
		30	48 (1219.2)	20 (508.0)	5.75 (146.1)
		42	60 (1524.0)	20 (508.0)	5.75 (146.1)
		48	60 (1524.0)	20 (508.0)	5.75 (146.1)
225 A Panelboards					
225 A ④ Main Lugs or Main Breaker	ED, EDH, EDC, FD, HFD, FDC Vertical	18	36 (914.4)	20 (508.0)	5.75 (146.1)
		30	48 (1219.2)	20 (508.0)	5.75 (146.1)
		42	48 (1219.2)	20 (508.0)	5.75 (146.1)
		48	60 (1524.0)	20 (508.0)	5.75 (146.1)
225 A ④ Main Lugs or Main Breaker with 225 A or 100 A Through-Feed Lugs or Sub-Feed Breaker	EHD, FDB, FD, HFD, FDC, ED, EDH, EDC Vertical	18	48 (1219.2)	20 (508.0)	5.75 (146.1)
		30	48 (1219.2)	20 (508.0)	5.75 (146.1)
		42	60 (1524.0)	20 (508.0)	5.75 (146.1)
		48	60 (1524.0)	20 (508.0)	5.75 (146.1)
400 A Panelboards					
400 A Main Lugs or Main Breaker	DK, KD, HKD, KDC Vertical	18	60 (1524.0)	20 (508.0)	5.75 (146.1)
		30	60 (1524.0)	20 (508.0)	5.75 (146.1)
		42	72 (1828.8)	20 (508.0)	5.75 (146.1)
		48	72 (1828.8)	20 (508.0)	5.75 (146.1)
400 A Main Lugs or Main Breaker with 225 A or 100 A Through-Feed Lugs or Sub-Feed Breaker	DK, KD, HKD, KDC Vertical	Main	60 (1524.0)	20 (508.0)	5.75 (146.1)
			72 (1828.8)	20 (508.0)	5.75 (146.1)
		Sub-Feed Breaker	72 (1828.8)	20 (508.0)	5.75 (146.1)
			90 (2286.0)	20 (508.0)	5.75 (146.1)

^① Smaller panelboard box sizes are available if required. Contact Eaton for application information.

^② Add 8 inches (203.2 mm) for TVSS.

^③ For horizontal mounted mains (GHB 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.

- 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:
5-1/2 inches (139.7 mm).