

**Duke University Medical School-
Duke School of Nursing**



Technical Report 2

**Electrical Systems Existing Conditions
& Building Load Summary Report**



Nicholas A. Kutchi

Consultant: Ted Dannerth, P.E.

November 2ND, 2007

Table of Contents

<u>Executive Summary</u>	2
<u>Single Line Drawing & Related Drawings</u>	3
<u>Summary Description of Distribution System</u>	3
<u>Service Entrance</u>	3
<u>Voltage Systems</u>	4
<u>Transformers</u>	4
<u>Emergency Power System</u>	5
<u>Over-current Devices</u>	5
<u>Major Equipment Switchgear Schedule</u>	5
<u>Lighting and Appliance Switchgear Schedule</u>	6
<u>Power Factor Correction</u>	6
<u>Design Issues</u>	6
<u>Lighting Loads</u>	7
<u>Mechanical and Other Loads</u>	7
<u>Service Entrance Size</u>	7
<u>Service Entrance Summary Table</u>	8
<u>Utility Company Information</u>	8
<u>Communication Systems</u>	8
<u>Appendix A Feeder Schedule</u>	9
<u>Appendix B Single Line Drawing</u>	10
<u>Appendix C Luminaire Schedule</u>	11
<u>Appendix D Mechanical Load Schedule</u>	12
<u>Appendix E HID Ballast Cutsheets</u>	13

Executive Summary

The following “Electrical Systems Existing Conditions and Building Load Summary Report” provides a detailed analysis of the electrical system within the Duke University Medical School- Duke School of Nursing. As a whole the electrical system found in the building was a rather simple system. The electrical system has an emergency generator that provides power to key elements in the building if the primary power fails. After analyzing the building, it was found that the primary operating voltage throughout the building was 277V, with the exception of 120V for all receptacles.

A detailed electrical load analysis was conducted along with the analysis of the electrical system. Three different methods were used to determine the load conditions within the building. The first method was the Conceptual and Schematic Phase load analysis. This method is a very rough estimate of the building loads and is used early in the design phase of a project. The second method was the Design Development load analysis. This method is a better estimate that provides a better sense of the loading within a building. Finally, the actual building loads were found in the Construction Document load analysis phase. These calculations provide the actual loads in the building, in which the electrical equipment was sized with. After performing these analysis it the margin of difference between actual equipment size and estimated size significantly decreased as you progressed from method 1 to method 3. Method 3 showed that the switchboard was sized appropriately, while the transformer was undersized. This under sizing of the transformer is common practice by utility companies, since transformers can take an overloading for short periods before overheating.

Power Systems

1. **Single Line Drawing and Related Drawings –**
 - a. The drawings used to create the single line drawing are:
 - i. E4.00- Riser Diagram
 - ii. E5.00- Motor Disconnect Schedule
 - iii. E6.01-Panels
 - iv. E6.02-Panels
 - b. Feeder Schedule (See Appendix A)
 - c. Single Line Drawing (See Appendix B)

2. **Summary Description of Distribution System -**

The Duke School of Nursing building has a radial distribution system. The 12.47 kV campus loop runs into an outdoor pad mounted 1000 kVA transformer. This transformer is the service entrance to the building and is fed through an underground ductbank and into the main electrical room located in the basement of the building. A 480Y/277V, 2000A switchboard distributes the incoming power to all the main panel boards on each floor. Finally, these main panel boards feed the branch circuits on each respective floor.

3. **Service Entrance –**

This project has a unique owner and utility relationship. The electrical distribution system serving the campus is a private system, owned and operated solely by Duke University.

 - a. The service entrance for the Duke School of Nursing is located at the outdoor pad mounted 1000 kVA transformer. The service transformer contains the main switch and over-current device for the entire building. The underground electrical ductbank runs through an owner owned meter and feeds a 480Y/277V, 2000A switchboard.

 - b. This transformer contains two transfer switches and one fused switch. The two transfer 15 kV switches are incoming loop load transfer switches. The other switch is a 15 kV primary fused switch. This equipment as well as all existing equipment and additions to the system are installed and maintained by the Facilities Management Department (FMD) High Voltage Shop, of Duke University.

4. Voltage Systems –

a. The service entrance provides the entire building with a 480Y/277V, 3Φ, 4-wire voltage system. The entire lighting system runs at 277V off of a 480Y/277V, 3Φ, 4 wire feeder, except one fixture type. All the receptacles throughout the building as well as this one fixture type are run at 120V off of a 208Y/120V, 3Φ, 4-wire feeder. There are a few motors in the building that are run at 208V off of a 208Y/120V, 3Φ, 4-wire feeder.

b. Transformers –

INDIVIDUAL TRANSFORMER SCHEDULE								
TAG	PRIMARY VOLTAGE	SECONDARY VOLTAGE	SIZE	TYPE	TEMP. RISE	TAPS	MOUNTING	REMARKS
TGA	480V,3PH,3W.	208Y/120V, 3PH,4W	30	DRY TYPE	115 DEGREE C	(2) 2.5% Above Normal Full Capacity (2) 2.5% Below Normal Full Capacity	PAD MOUNTED ON FLOOR	RM 0003ER Basement Mechanical Room
TGS	480V,3PH,3W.	208Y/120V, 3PH,4W	15	DRY TYPE	115 DEGREE C	(1) 5% Above Normal Full Capacity (1) 5% Below Normal Full Capacity	SUSPENDED	RM 0004ER Basement Electrical Room
TGE	480V,3PH,3W.	208Y/120V, 3PH,4W	15	DRY TYPE	115 DEGREE C	(1) 5% Above Normal Full Capacity (1) 5% Below Normal Full Capacity	SUSPENDED	RM 0004ER Basement Electrical Room
T1A	480V,3PH,3W.	208Y/120V, 3PH,4W	112.5	DRY TYPE	115 DEGREE C	(2) 2.5% Above Normal Full Capacity (2) 2.5% Below Normal Full Capacity	PAD MOUNTED ON FLOOR	RM 1016ER First Floor Electrical Room
T2A	480V,3PH,3W.	208Y/120V, 3PH,4W	112.5	DRY TYPE	115 DEGREE C	(2) 2.5% Above Normal Full Capacity (2) 2.5% Below Normal Full Capacity	PAD MOUNTED ON FLOOR	RM 2054ER Second Floor Electrical Room
T3A	480V,3PH,3W.	208Y/120V, 3PH,4W	112.5	DRY TYPE	115 DEGREE C	(2) 2.5% Above Normal Full Capacity (2) 2.5% Below Normal Full Capacity	PAD MOUNTED ON FLOOR	RM 3090ER Third Floor Electrical Room

5. Emergency Power System-

The emergency life safety system is fed by a generator located in the basement electrical room of the building. The emergency generator is a 60 kW, 480Y/277V, 3P, 4W packaged engine generator that is fueled by natural gas. There is a 100 gallon tank that holds enough natural gas to provide 10 hours of operation when the primary power is disrupted.

The emergency power system uses an automatic transfer switch, which provides power to all the life safety loads. These life safety loads include the fire alarm system, fire pumps, and all the emergency lighting. The luminaires designated as emergency fixtures all contain integral emergency bypass devices, to override switched fixtures.

The automatic transfer switch senses a disruption in the primary electrical service and signals the generator engine to start and then transfers the load to the emergency circuits. Once the primary power is restored, the automatic transfer switch transfers the load back to primary power and signals the generator to turn off.

6. Over-current Devices –

Stationary circuit breakers are the over-current device used throughout the building. There is one fused cutout switch at the service entrance in the exterior transformer.

7. Locations of Switchgear –

a. Major Equipment Switchgear Schedule

MAJOR EQUIP SWITCHGEAR SCHEDULE						
TAG	TYPE	FLOOR LEVEL	ROOM NAME	ROOM NUMBE	DRAWING NUMBER	DETAIL NUMBER
G	GENERATOR	BASEMENT	GAS GENERATOR ROOM	0002MR	E1.00	N/A
DGE	EMERG DISTR. PANEL	BASEMENT	ELECTRICAL	0004ER	E1.00	N/A
	TRANSFER SWITCH	BASEMENT	ELECTRICAL	0004ER	E1.00	N/A
SWBD	SWITCHBOARD	BASEMENT	ELECTRICAL	0003ER	E1.00	N/A
TGE	TRANSFORMER	BASEMENT	ELECTRICAL	0004ER	E1.00	3/E1.00
	TRANSFER SWITCH	BASEMENT	ELECTRICAL	0004ER	E1.00	N/A
TGS	TRANSFORMER	BASEMENT	ELECTRICAL	0004ER	E1.00	N/A
TGA	TRANSFORMER	BASEMENT	ELECTRICAL	0003ER	E1.00	N/A
T1A	TRANSFORMER	FIRST	ELECTRICAL	1016ER	E1.01	3/E4.00
T2A	TRANSFORMER	SECOND	TELECOM	2060TC	E1.02	4/E4.00
T3A	TRANSFORMER	THIRD	ELECTRICAL	3090ER	E1.03	5/E4.00

b. Lighting and Appliance Switchgear Schedule

LIGHTING & APPLIANCE SWITCHGEAR SCHEDULE								
TAG	TYPE	FLOOR LEVEL	ROOM NAME	ROOM NUMBE	DRAWING NUMBER	DETAIL NUMBER	LIGHTING PANELS	
							VOLTAGE	Main Size
HGE	EMERG LIFE SAFETY PANEL	BASEMENT	ELECTRICAL	0004ER	E 1.00	N/A	100A	480Y/277V,3P,4,W
RGE	RECEPT PANEL	BASEMENT	ELECTRICAL	0004ER	E 1.00	N/A	100A	208Y/120V,3P,4W
HGS	EMERG STANDBY PANEL	BASEMENT	ELECTRICAL	0004ER	E 1.00	N/A	100A	480Y/277V,3P,4,W
RGS	STANDBY PANEL	BASEMENT	ELECTRICAL	0004ER	E 1.00	N/A	100A	208Y/120V,3P,4,W
HGA	PANEL	BASEMENT	ELECTRICAL	0003ER	E 1.00	N/A	100A	480Y/277V,3P,4,W
RGA	RECEPT PANEL	BASEMENT	ELECTRICAL	0003ER	E 1.00	N/A	100A	208Y/120V,3P,4,W
HGB	PANEL	BASEMENT	MECHANICAL	0001MR	E 1.00	N/A	400A	480Y/277V,3P,4,W
R1C	RECEPT PANEL	FIRST	STORAGE	1003A	E 1.01	N/A	225A	208Y/120V,3P,4W
H1A	PANEL	FIRST	ELECTRICAL	1016ER	E 1.01	3/E4.00	225A	480Y/277V,3P,4,W
R1A	RECEPT PANEL	FIRST	ELECTRICAL	1016ER	E 1.01	3/E4.00	400A	208Y/120V,3P,4,W
L1	LGT PANEL	FIRST	ELECTRICAL	1016ER	E 1.01	3/E4.00	60A	480Y/277V,3P,4,W
L1E	EMERG LGT PANEL	FIRST	ELECTRICAL	1016ER	E 1.01	3/E4.00	60A	480Y/277V,3P,4,W
D1A	DIMMING PANEL	FIRST	ELECTRICAL	1016ER	E 1.01	3/E4.00	60A	480Y/277V,3P,4,W
D1E	DIMMING PANEL	FIRST	ELECTRICAL	1016ER	E 1.01	3/E4.00	60A	480Y/277V,3P,4,W
R1D	RECEPT PANEL	FIRST	AV	102B	E 1.01	N/A	100A	208Y/120V,3P,4W
R1B	RECEPT PANEL PHASE 2	FIRST	RECYCLING	1100	E 1.05	N/A	100A	208Y/120V,3P,4W
R2C	RECEPT PANEL	SECOND	STORAGE	202B	E 1.02	N/A	225A	208Y/120V,3P,4W
H2A	PANEL	SECOND	TELECOM	2060TC	E 1.02	4/E4.00	225A	480Y/277V,3P,4,W
R2A	RECEPT PANEL	SECOND	TELECOM	2060TC	E 1.02	4/E4.00	400A	208Y/120V,3P,4W
R2S	RECEPT PANEL	SECOND	TELECOM	2060TC	E 1.02	4/E4.00	100A	208Y/120V,3P,4W
L2A	LGT PANEL	SECOND	TELECOM	2060TC	E 1.02	4/E4.00	60A	480Y/277V,3P,4,W
R2B	RECEPT PANEL PHASE 2	SECOND	STORAGE	2104	E 1.05	N/A	100A	208Y/120V,3P,4W
L2B	LGT PANEL PHASE 2	SECOND	STORAGE	2104	E 1.05	N/A	60A	480Y/277V,3P,4,W
R3C	RECEPT PANEL	THIRD	CLOSET	3028B	E 1.03	N/A	225A	208Y/120V,3P,4W
H3A	PANEL	THIRD	ELECTRICAL	3090ER	E 1.03	5/E4.00	1200A	480Y/277V,3P,4,W
R3A	RECEPT PANEL	THIRD	ELECTRICAL	3090ER	E 1.03	5/E4.00	400A	208Y/120V,3P,4W
L3	LGT PANEL	THIRD	ELECTRICAL	3090ER	E 1.03	5/E4.00	60A	480Y/277V,3P,4,W
D3	DIMMING PANEL	THIRD	CLOSET	3028B	E 1.03	N/A	30A	277V,1P,2W
R3B	RECEPT PANEL PHASE 2	THIRD	ELECTRICAL	3105ER	E 1.05	N/A	100A	208Y/120V,3P,4W

8. **Power Factor Correction** –

According to the Mechanical- Motor section of the Specifications, all motors that are 10 hp or more are required to have power factor correction capacitors. There is no indication of power factor correction devices on the electrical drawings or in the MCC. They are only mentioned in the Specifications.

9. **Design Issues** –

The building was designed in two phases. The first phase is the current building that is built and in use right now. The second phase is a potential addition to the North end of the building, which is already designed. With this potential addition in the future, the electrical designer sized all of the equipment to handle both phases of the building.

10. **Lighting Loads** –

The primary lighting sources used throughout the building are linear fluorescents and compact fluorescents. Occupancy as well as daylight controls are used throughout the building to meet and in cases exceed the ASHRAE/IESNA 90.1 energy standard.

a.) Luminaire Schedule (See Appendix B)

11. **Mechanical and Other Loads** –

a. Mechanical Schedule (See Appendix C)

12. **Service Entrance Size** –

a. Service Entrance Size:

Service Entrance Size						
Conceptual and Schematic Phases						
Floor Level	Floor Area (ft²)	VA per ft²	Total kVA	Total Current (A) at 480V		
Basement	2,830	8	23	27		
First Floor	20,300	8	162	195		
Second Floor	18,340	8	147	176		
Third Floor	18,140	8	145	175		
Total Building	59,610	8	477	574		
Design Development Phase						
Loads	VA per ft²	Total Building ft²	Total kVA	Total Current (A) at 480V		
Receptacles	1	59,610	60	72		
Lighting	3	59,610	179	215		
Fans/Pumps	2	59,610	119	143		
HVAC	7	59,610	417	502		
Total Building	13	59,610	775	932		
Actual Loading						
Feeder	Serving	Conductor Wire Size	NEC Wire Ampacity	Demand Factor	Total Current (A) at 480V	Total kVA
19	PNL HGA	1AWG	130	0.65	85	70
20	STANDBY ATS	8AWG	50	0.65	33	27
21	EMERG ATS	8AWG	50	0.65	33	27
22	PNL H1A	4/0AWG	230	0.65	150	124
23	PNL H2A	4/0AWG	230	0.65	150	124
24	PNL H3A	(3) 600 KCMIL	1,260	0.65	819	681
25	PNL HGB	350 KCMIL	310	0.65	202	168
ELEVATOR1	-	2/0AWG	175	0.65	114	95
ELEVATOR2	-	2/0AWG	175	0.65	114	95
Total Building					1,697	1,410

b. Service Entrance Summary Table:

Service Entrance Summary Table		
	Total kVA	Total Current (A)
Method 1	477	574
Method 2	775	932
Method 3	1,410	1,697
Design Equipment	1,000	2,000

13. Utility Company Information –

- a. Duke Energy
526 South Church Street
Charlotte, NC 28202.
1-800-777-9898
<http://www.duke-energy.com/nc-rate-review/default.asp>

- b. The rate of \$0.046/kWH daytime & \$0.029/KWH nighttime is the 2003 rate at which the building was designed upon. This information was provided by the electrical designer. According to John Kramer, P.E. of DUMC Engineering and Operations explained that the campus has 5 that feed 100+ buildings. Duke gets 5 bills a month from Duke Energy. It is a time of day type structure. Duke then takes the bills on a per substation basis and divide the cost up between connected buildings, based on monthly kWH readings in each building. The rate structure used does not allow the buildings to do peak shaving, for example. Mr. Kramer sent me the monthly bills that show the average cost per kWH, consumption, and demands. However, due to confidentiality issues, I am not allowed to post these findings. I am only allowed to post that the current average rate for 2007 is about \$0.049/kWH.

c. 12 Month Electrical Data Survey

Duke School of Nursing	
Electical Data 12 month Survey	
Date	kWH
7/1/2006	150,402
8/1/2006	167,920
9/1/2006	153,355
10/1/2006	132,168
11/1/2006	89,475
12/1/2006	84,278
1/1/2007	86,436
2/1/2007	70,991
3/1/2007	85,038
4/1/2007	104,862
5/1/2007	131,113
6/1/2007	157,666

Communication Systems-

Telephone/Data-

The telephone and data system is comes form the outside into the first floor Telecommunication Room, RM 1016TC. This telephone and data is then run throughout the first floor and into the other telecommunication rooms on the other floors. Almost every classroom, office, and group gathering areas receive telephone, data, and cable television.

Audio Visual-

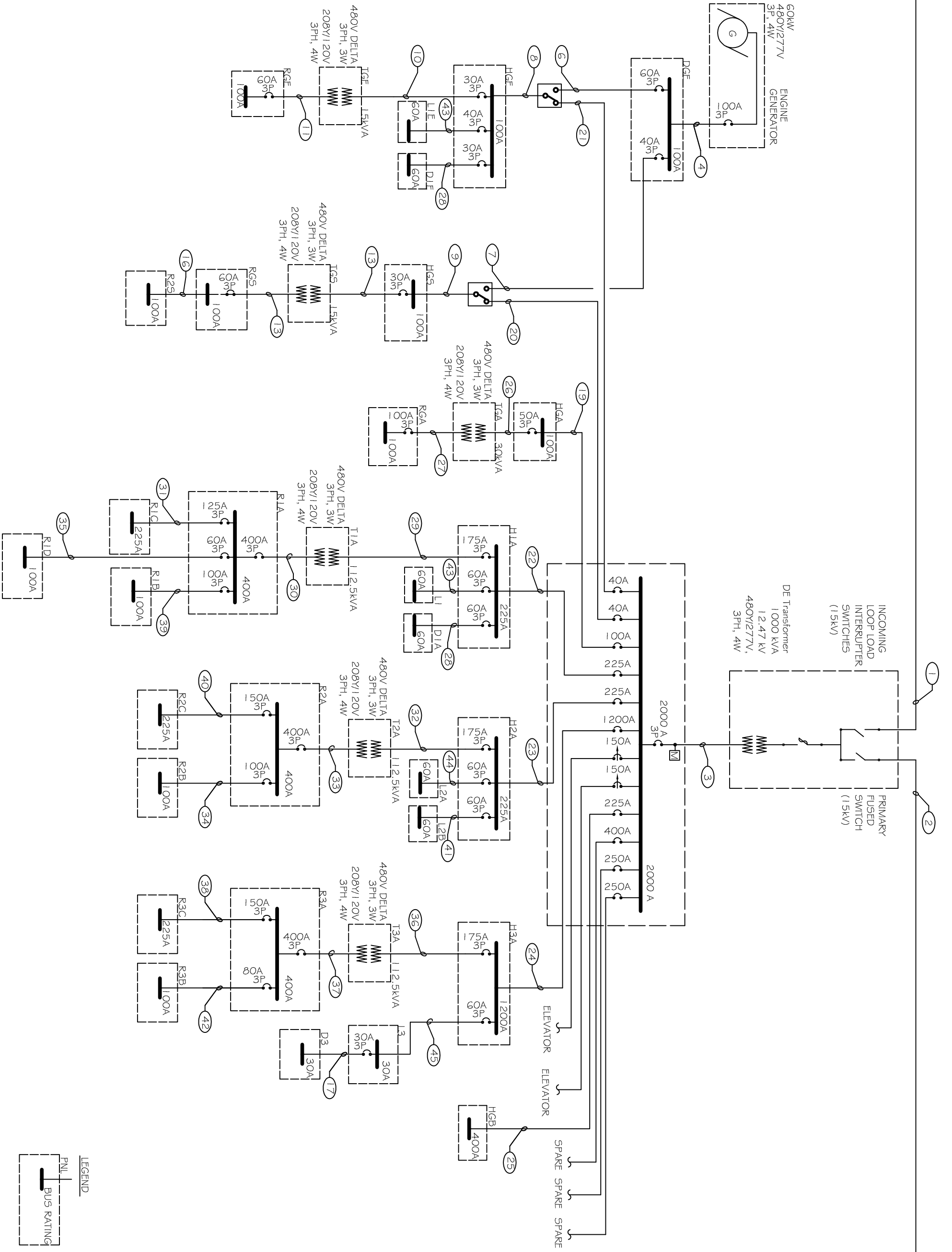
The audio visual equipment is run from audio visual closets in the large classrooms/auditorium, the Deans office, and the conference rooms. This system includes projectors, automatic projector screens, speakers, and microphones.

Fire Alarm-

The main Fire Alarm Enunciator Panel is located in the main entrance lobby of the tower. The system is composed of room/duct smoke detectors, manual pull stations, strobe lights, heat detectors and door holders. These devices are found throughout the building on all floors.

FEEDER SCHEDULE

TAG	SERVING	SERVED FROM	NO. OF SETS	CONDUIT (PER SET) SIZE	CONDUCTORS (PER SET)								
					PHASE CONDUCTORS			NEUTRAL CONDUCTORS			GROUND CONDUCTORS		
					No.	SIZE	TYPE	No.	SIZE	TYPE	No.	SIZE	TYPE
1	15KV SWGR	12.47 KV CAMPUS LOOP	-	4"	-	-	-	-	-	-	-	-	-
2	15KV SWGR	12.47 KV CAMPUS LOOP	-	4"	-	-	-	-	-	-	-	-	-
3	SWBD	SERVICE XFMR	6	4"	3	400 KCMIL	CU THWN	1	400 KCMIL	CU THWN	6	3/0AWG	
4	PNL DGE	GENERATOR	1	1.5"	3	2AWG	CU THWN	1	2AWG	CU THWN	1	6AWG	CU THWN
5	NOT USED	NOT USED	-	-	-	-	-	-	-	-	-	-	-
6	EMERG ATS	PNL DGE	1	3/4"	3	8AWG	CU THWN	1	8AWG	CU THWN	1	10AWG	CU THWN
7	STANDBY ATS	PNL DGE	1	3/4"	3	8AWG	CU THWN	1	8AWG	CU THWN	1	10AWG	CU THWN
8	PNL HGE	EMERG ATS	1	1"	3	4AWG	CU THWN	1	4AWG	CU THWN	1	10AWG	CU THWN
9	PNL HGS	STANDBY ATS	1	3/4"	3	8AWG	CU THWN	1	8AWG	CU THWN	1	10AWG	CU THWN
10	XFMR TGE	PNL HGE	1	3/4"	3	10AWG	CU THWN	1	10AWG	CU THWN	1	10AWG	CU THWN
11	PNL RGE	XFMR TGE	1	1.25"	3	4AWG	CU THWN	1	4AWG	CU THWN	1	8AWG	CU THWN
12	XFMR TGS	PNL HGS	1	3/4"	3	10AWG	CU THWN	-	-	CU THWN	1	10AWG	CU THWN
13	PNL RGS	XFMR TGS	1	1.25"	3	4AWG	CU THWN	1	4AWG	CU THWN	1	8AWG	CU THWN
14	DIM PNL D1E	PNL HGE	1	3/4"	3	10AWG	CU THWN	1	10AWG	CU THWN	1	10AWG	CU THWN
15	PNL L1E	PNL HGE	1	3/4"	3	8AWG	CU THWN	1	8AWG	CU THWN	1	10AWG	CU THWN
16	PNL R2S	PNL RGS	1	3/4"	3	8AWG	CU THWN	1	8AWG	CU THWN	1	10AWG	CU THWN
17	DIM PNL D3	PNL L3	1	3/4"	2	10AWG	CU THWN	-	-	CU THWN	1	10AWG	CU THWN
18	NOT USED	NOT USED	-	-	-	-	-	-	-	-	-	-	-
19	PNL HGA	SWBD	1	1.5"	3	1AWG	CU THWN	1	1AWG	CU THWN	1	8AWG	CU THWN
20	STANDBY ATS	SWBD	1	3/4"	3	8AWG	CU THWN	1	8AWG	CU THWN	1	10AWG	CU THWN
21	EMERG ATS	SWBD	1	3/4"	3	8AWG	CU THWN	1	8AWG	CU THWN	1	10AWG	CU THWN
22	PNL H1A	SWBD	1	2.5"	3	4/0AWG	CU THWN	1	4/0AWG	CU THWN	1	4AWG	CU THWN
23	PNL H2A	SWBD	1	2.5"	3	4/0AWG	CU THWN	1	4/0AWG	CU THWN	1	4AWG	CU THWN
24	PNL H3A	SWBD	3	3"	3	600 KCMIL	CU THWN	1	600 KCMIL	CU THWN	3	3/0AWG	CU THWN
25	PNL HGB	SWBD	1	3"	3	350 KCMIL	CU THWN	1	350 KCMIL	CU THWN	1	4AWG	CU THWN
26	XFMR TGA	PNL HGA	1	3/4"	3	6AWG	CU THWN	-	-	CU THWN	1	10AWG	CU THWN
27	PNL RGA	XFMR TGA	1	1.5"	3	1AWG	CU THWN	1	1AWG	CU THWN	1	6AWG	CU THWN
28	DIM PNL D1A	PNL H1A	1	1.25"	3	4AWG	CU THWN	1	4AWG	CU THWN	1	8AWG	CU THWN
29	XFMR T1A	PNL H1A	1	2"	3	2/0AWG	CU THWN	-	-	CU THWN	1	6AWG	CU THWN
30	PNL R1A	XFMR T1A	1	3"	3	500 KCMIL	CU THWN	1	500 KCMIL	CU THWN	1	1/0AWG	CU THWN
31	PNL R1C	PNL R1A	1	2"	3	2/0AWG	CU THWN	1	2/0AWG	CU THWN	1	4AWG	CU THWN
32	XFMR T2A	PNL H2A	1	2"	3	2/0AWG	CU THWN	-	-	CU THWN	1	6AWG	CU THWN
33	PNL R2A	XFMR T3A	1	3"	3	500 KCMIL	CU THWN	1	500 KCMIL	CU THWN	1	1/0AWG	CU THWN
34	PNL R2C	PNL R2A	1	2"	3	2/0AWG	CU THWN	1	2/0AWG	CU THWN	1	4AWG	CU THWN
35	PNL R1D	PNL R1A	1	1.25"	3	4AWG	CU THWN	1	4AWG	CU THWN	1	10AWG	CU THWN
36	XFMR T3A	PNL H3A	1	2"	3	2/0AWG	CU THWN	-	-	CU THWN	1	6AWG	CU THWN
37	PNL R3A	XFMR T3A	1	3"	3	500 KCMIL	CU THWN	1	500 KCMIL	CU THWN	1	1/0AWG	CU THWN
38	PNL R3C	PNL R3A	1	2"	3	2/0AWG	CU THWN	1	2/0AWG	CU THWN	1	4AWG	CU THWN
39	PNL R1B	PNL R1A	1	1.5"	3	1/0AWG	CU THWN	1	1/0AWG	CU THWN	1	4AWG	CU THWN
40	PNL R2B	PNL R2A	1	1.5"	3	1/0AWG	CU THWN	1	1/0AWG	CU THWN	1	4AWG	CU THWN
41	PNL L2B	PNL H2A	1	1.25"	3	4AWG	CU THWN	1	4AWG	CU THWN	1	10AWG	CU THWN
42	PNL R3B	PNL R3A	1	1.5"	3	2AWG	CU THWN	1	2AWG	CU THWN	1	6AWG	CU THWN
43	PNL L1	PNL H1A	1	1.25"	3	4AWG	CU THWN	1	4AWG	CU THWN	1	10AWG	CU THWN
44	PNL L2A	PNL H2A	1	1.25"	3	4AWG	CU THWN	1	4AWG	CU THWN	1	10AWG	CU THWN
45	PNL L3	PNL H3A	1	1.25"	3	4AWG	CU THWN	1	4AWG	CU THWN	1	10AWG	CU THWN



BY: NICHOLAS A. KUTCHI
 NOVEMBER 2, 2007
 CONSULTANT: TED DANNERTH, P.E.

DUKE UNIVERSITY MEDICAL SCHOOL: DUKE SCHOOL OF NURSING
 DURHAM, NORTH CAROLINA

AE 481W
 TECHNICAL ASSIGNMENT II
 SINGLE LINE DRAWING



Appendix B

LIGHTING FIXTURE SCHEDULE															
FIXTURE TAG	HOUSING/TRIM COLOR	VOLTAGE	TOTAL FIXTURE WATTAGE	BALLAST FACTOR	POWER FACTOR	STARTING CURRENT	RUNNING CURRENT	MANUFACTURE SEE NOTE 1	CATALOG SEE NOTE 2	LAMP NO.	BALLAST TYPE	MOUNTING TYPE	MAXIMUM FIXTURE DEPTH/HEIGHT	REMARKS	
															LAMP TYPE
A1	WHITE	277	78	0.95	0.99	0.28	0.28	METALLUX	20C-28X43A-125-277	2	F40DU/35	ELECTRONIC BALLAST NO DIMMING	CEILING RECESSED	5-IN	STATIC LENSED TROFFER
A3	WHITE	277	107	1.18	0.98	0.29	0.29	METALLUX	20C-332A125-277	3	F032R35/XP/ECO	ELECTRONIC BALLAST NO DIMMING	CEILING RECESSED	5-IN	STATIC LENSED TROFFER
A3E	WHITE	277	107	1.18	0.98	0.29	0.29	METALLUX	20C-332A125-277-EMERG	3	F032R35/XP/ECO	ELECTRONIC BALLAST NO DIMMING	CEILING RECESSED	5-IN	STATIC LENSED TROFFER OUTER TWO LAMPS FOR EMERG
A4	WHITE	277	79	1.38	0.98	0.29	0.29	METALLUX	20C-332A125-277	2	F032R35/XP/ECO	ELECTRONIC BALLAST NO DIMMING	CEILING RECESSED	5-IN	STATIC LENSED TROFFER
B2	WHITE	277	103	0.86	0.99	0.37	0.37	METALLUX	2EP30X-2B40-S29-277-2BALLASTS	3	F40DU/35	ELECTRONIC BALLAST NO DIMMING	CEILING RECESSED	3-IN	9-CELL PARABOLIC
B2E	WHITE	277	103	0.86	0.99	0.37	0.37	METALLUX	2EP30X-2B40-S29-277-2BALLASTS+EMERG	3	F40DU/35	ELECTRONIC BALLAST NO DIMMING	CEILING RECESSED	3-IN	9-CELL PARABOLIC INTEGRAL EMERG BYPASS
B3	WHITE	277	107	1.18	0.98	0.29	0.29	METALLUX	2EP30X-332S361-277	3	F032R35/XP/ECO	ELECTRONIC BALLAST NO DIMMING	CEILING RECESSED	3-IN	18-CELL PARABOLIC
B3D	WHITE	277	107	1.18	0.98	0.29	0.29	METALLUX	2EP30X-332S361-277 BALLAST: (1) ECO-T832-277-3	3	F032R35/XP/ECO	LUTRON ECO-T832-277-3	CEILING RECESSED	3-IN	18-CELL PARABOLIC DIMMING
B3E	WHITE	277	107	1.18	0.98	0.29	0.29	METALLUX	2EP30X-332S361-277 +EMERG	3	F032R35/XP/ECO	ELECTRONIC BALLAST NO DIMMING	CEILING RECESSED	3-IN	18-CELL PARABOLIC OUTER TWO LAMPS FOR EMERG
C2	WHITE	277	79	1.38	0.98	0.29	0.29	METALLUX	EP30X-23251811-277	2	F032R35/XP/ECO	ELECTRONIC BALLAST NO DIMMING	CEILING RECESSED	3-IN	8-CELL PARABOLIC
C4	WHITE	277	33	1.04	0.99	0.12	0.12	Pinnacle	E4W-4-18T8-F-277-W.P.L.	1	FP28/35/ECO	ELECTRONIC BALLAST NO DIMMING	CEILING RECESSED	4-IN	4-IN WIDE X 4-FT LINEAR PARABOLIC WALLWASH
D2	WHITE	277	78	0.95	0.99	0.28	0.28	H.E. WILLIAMS	DIG-822-240TT-WPRL-EB2-277	2	F40DU/35	ELECTRONIC BALLAST NO DIMMING	CEILING RECESSED	5-IN	RECESSED DIRECT/INDIRECT
D2E	WHITE	277	78	0.95	0.99	0.28	0.28	H.E. WILLIAMS	DIG-822-240TT-WPRL-EB2-277-EMERG	2	F40DU/35	ELECTRONIC BALLAST NO DIMMING	CEILING RECESSED	5-IN	RECESSED DIRECT/INDIRECT INTEGRAL EMERG BYPASS
F2	LOW IRIDESCENT FINISH	277	36	1.05	0.98	0.14	0.14	PORTFOLIO	C642-E-6410-LI	1	CF32D7E/N/35	ELECTRONIC BALLAST NO DIMMING	CEILING RECESSED	10-IN	6-IN DIA SELF FLANGED REFLECTOR
F2D	N/A	277	79	1.38	0.98	0.29	0.29	BELFER	2B5-FX2-40-2-D-LENGTH	2	CONTINUOUS FT40DU-35 LAMPS OVERLAPPED END-TO-END	ELECTRONIC BALLAST NO DIMMING	SURFACE CEILING COVE	N/A	FIELD CURVABLE CFLS DIMMING
F3	LOW IRIDESCENT FINISH	277	20	1.00	0.99	0.07	0.07	PORTFOLIO	C4013-E-4051-LJ	1	CF18D7E/N/35	ELECTRONIC BALLAST NO DIMMING	CEILING RECESSED	7.75-IN	4.5-IN DIA VERT MTD TRIPLE-TUBE CFL SELF FLANGED REFLECTOR
F4	LOW IRIDESCENT FINISH	277	29	1.05	0.98	0.11	0.11	PORTFOLIO	C6132-E-6151-L1	1	CF28D7E/N/35	ELECTRONIC BALLAST NO DIMMING	CEILING RECESSED	6.5-IN	6-IN DIA HORZ MTD TRIPLE-TUBE CFL SELF FLANGED REFLECTOR
F4D	LOW IRIDESCENT FINISH	277	29	1.05	0.98	0.11	0.11	PORTFOLIO	C6132-E-6151-L1+DM	1	CF28D7E/N/35	LUTRON F0B-T426-277-1	CEILING RECESSED	6.5-IN	6-IN DIA HORZ MTD TRIPLE-TUBE CFL SELF FLANGED REFLECTOR DIMMING
F4E	LOW IRIDESCENT FINISH	277	29	1.05	0.98	0.11	0.11	PORTFOLIO	C6132-E-6151-L1+DM +EMERG	1	CF28D7E/N/35	LUTRON F0B-T426-277-1	CEILING RECESSED	6.5-IN	SAME AS F4D EXCEPT WITH INTEGRAL EMERG BYPASS
F5	WHITE TRIM SEMI-SPEC CLEAR ALZAK REFL	277	48	1.02	0.90	0.30	0.19	PORTFOLIO	MD6-39-2E-6781-LJ-10	1	PHILIPS COM93PAR30JAMP-L	MAGNETIC BALLAST NO DIMMING	CEILING RECESSED	10-IN	6-IN DIA PAR30 CERAMIC METAL HALIDE WET LISTED
F6	WHITE	277	29	1.05	0.98	0.11	0.11	PORTFOLIO	C6132-E-6151-19-1	1	CF28D7E/N/35	ELECTRONIC BALLAST NO DIMMING	CEILING RECESSED	6.5-IN	6-IN DIA LENSED HORZ MTD TRIPLE-TUBE CFL SELF FLANGED REFLECTOR
G1	SATIN STAINLESS STEEL	277	156	0.95	0.99	0.28	0.28	SHAPER	M82-12X36-CFL-460-277-SAL-DM-HTBVTB-LOGO-S4-CUSTOM	4	FT40DU/35	LUTRON (2) F0B-2277-277-2	CEILING PENDANT	36-IN	CUSTOM ARCHITECTURAL PENDANT, DIMMING BALLAST INTEGRAL TO HOUSING
G2	SATIN STAINLESS STEEL	277	156	0.95	0.99	0.28	0.28	SHAPER	M82-12X36-CFL-460-277-SAL-DM-HTBVTB-LOGO-S4-CUSTOM	4	FT40DU/35	ELECTRONIC BALLAST NO DIMMING	CEILING PENDANT	36-IN	SAME AS G1 EXCEPT WITH ELECTRONIC BALLAST, NO DIMMING
G3	SATIN STAINLESS STEEL	277	51	1.05	0.98	0.11	0.11	SHAPER	44B-DR-20-CFL-226-277-553	2	CF28D7E/N/35	ELECTRONIC BALLAST NO DIMMING	CEILING SURFACE	6.625-IN	ARCHITECTURAL SURFACE LUMINOUS BOWL, 20-IN DIA BY 6.625 HIGH, DAMP LISTED
H2	SATIN STAINLESS STEEL	277	63	1.03	0.98	0.23	0.23	CORELITE	A2-WP-275-1C-277-AC24-T1-8FT-ER	2	FP28/35/ECO	ELECTRONIC BALLAST NO DIMMING	CEILING PENDANT	3-IN	4-FT LINEAR STEEL PENDANT SEMI-INDIRECT
H3	SATIN STAINLESS STEEL	277	126	1.03	0.98	0.23	0.23	CORELITE	A2-WP-275-1C-277-AC24-T1-8FT-ER	4	FP28/35/ECO	ELECTRONIC BALLAST NO DIMMING	CEILING PENDANT	3-IN	8-FT LINEAR STEEL PENDANT SEMI-INDIRECT
H5	SATIN STAINLESS STEEL	277	480	1.03	0.98	0.23	0.23	FOCAL POINT	FV35-PDR-375-2C-277-E-C24-WH-20FT	15	FP28/35/ECO	ELECTRONIC BALLAST NO DIMMING	CEILING PENDANT	3-IN	20-FT LINEAR STEEL PENDANT INDIRECT DIRECT
H5E	SATIN STAINLESS STEEL	277	480	1.03	0.98	0.23	0.23	FOCAL POINT	FV35-PDR-375-2C-277-E-C24-WH-20FT-EMERG	15	FP28/35/ECO	ELECTRONIC BALLAST NO DIMMING	CEILING PENDANT	3-IN	20-FT LINEAR STEEL PENDANT INDIRECT DIRECT INTEGRAL EMERG BYPASS
H5D	SATIN STAINLESS STEEL	277	480	1.03	0.98	0.23	0.23	FOCAL POINT	FV35-PDR-375-2C-277-D-C24-WH-20FT	15	FP28/35/ECO	LUTRON ECO-T528-277	CEILING PENDANT	3-IN	20-FT LINEAR STEEL PENDANT INDIRECT DIRECT DIMMING
H6	SATIN STAINLESS STEEL	277	384	1.03	0.98	0.23	0.23	FOCAL POINT	FV35-375-2C-277-E-C24-WH-16FT	12	FP28/35/ECO	ELECTRONIC BALLAST NO DIMMING	CEILING PENDANT	3-IN	16-FT LINEAR STEEL PENDANT INDIRECT DIRECT
H6D	SATIN STAINLESS STEEL	277	384	1.03	0.98	0.23	0.23	FOCAL POINT	FV35-PDR-375-2C-277-D-C24-WH-16FT	12	FP28/35/ECO	LUTRON ECO-T528-277	CEILING PENDANT	3-IN	16-FT LINEAR STEEL PENDANT INDIRECT DIRECT DIMMING
H7D	SATIN STAINLESS STEEL	277	480	1.03	0.98	0.23	0.23	NEORAY	HDP-375-24-8C-20FT-277-DSDIM	15	FP28/35/ECO	LUTRON ECO-T528-277	CEILING PENDANT	3-IN	20-FT LINEAR STEEL PENDANT "EUROPA" STYLE DIMMING
H8D	SATIN STAINLESS STEEL	277	252	1.03	0.98	0.23	0.23	CORELITE	AI-WN-275-2C-277-AC24-16FT	8	FP28/35/ECO	LUTRON (4) ECO-T528-277	CEILING PENDANT	3-IN	16-FT LINEAR STEEL PENDANT INDIRECT DIMMING
H8E	SATIN STAINLESS STEEL	277	252	1.03	0.98	0.23	0.23	CORELITE	AI-WN-275-2C-277-AC24-16FT +EMERG	8	FP28/35/ECO	LUTRON (4) ECO-T528-277	CEILING PENDANT	3-IN	16-FT LINEAR STEEL PENDANT INDIRECT INTEGRAL EMERG BYPASS
H8D	SATIN STAINLESS STEEL	277	126	1.03	0.98	0.23	0.23	NEORAY	FV35-PDR-275-2C-277-D-C24-WH-8FT	4	FP28/35/ECO	LUTRON (2) ECO-T528-277	CEILING PENDANT	3-IN	8-FT LINEAR STEEL PENDANT INDIRECT DIRECT DIMMING
H11E	SATIN STAINLESS STEEL	277	288	1.03	0.98	0.23	0.23	FOCAL POINT	FV35-PDR-375-2C-277-E-C24-WH-12FT+EMERG	9	FP28/35/ECO	ELECTRONIC BALLAST NO DIMMING	CEILING PENDANT	3-IN	12-FT LINEAR STEEL PENDANT INDIRECT DIRECT INTEGRAL EMERG BYPASS
J1	WHITE	277	79	1.38	0.98	0.29	0.29	NEORAY	70-1-T8-974-LENGTH-277	2	CONTINUOUS F032R35/XP/ECO	ELECTRONIC BALLAST NO DIMMING	CEILING RECESSED	10.5-IN	RECESSED PERIMETER WALLWASH 4-IN WIDE STAGGERED LAMPS FOR CONTIGOUS LIGHTING
K1	WHITE	120	150	1.00	1.00	1.25	1.25	HUBBELL	NV185GG	1	150W	N/A	WALL SURFACE	N/A	
L2D	WHITE	277	33	1.03	0.99	0.12	0.12	WYNONA LIGHTING	P1-MC-148T5-277V-MCV-KA-DM	1	FP28/35/ECO	LUTRON ECO-T528-277	TOP OF BEAM SURFACE	2.5-IN	
M1	BRUSHED ALUMINUM	277	27	1.05	0.98	0.11	0.11	SHAPER	673-36-T5121-277V-SSS-CUSTOM	1	CF28D7E/N/35	ELECTRONIC BALLAST NO DIMMING	WALL SURFACE	36-IN	
M3	BRUSHED ALUMINUM	277	29	0.91	0.98	0.35	0.35	MANNING LIGHTING	LB-272-ADA-PT-BA-2313-277-M1	2	CF13D7E/N/35	ELECTRONIC BALLAST NO DIMMING	WALL SURFACE	15-IN	
N1	WHITE	277	34	0.90	0.98	0.13	0.13	ALKCO	TAB13-RBW-WH	1	F032R35/XP/ECO	ELECTRONIC BALLAST NO DIMMING	WALL SURFACE	N/A	
N2	WHITE	277	22	1.00	0.97	0.08	0.08	METALLUX	BC-117-277-EB81	1	F017835/XP/ECO	ELECTRONIC BALLAST NO DIMMING	WALL SURFACE	N/A	
N3	WHITE	277	34	0.90	0.98	0.13	0.13	METALLUX	BC-132-277-EB81	1	F032R35/XP/ECO	ELECTRONIC BALLAST NO DIMMING	WALL SURFACE	N/A	
N4	WHITE	277	79	1.38	0.98	0.29	0.29	METALLUX	BAU-232-277-EB81	2	F032R35/XP/ECO	ELECTRONIC BALLAST NO DIMMING	WALL SURFACE	N/A	
P2	WHITE	277	79	1.38	0.98	0.29	0.29	METALLUX	IA-232-277-EB81-SCA	2	F032R35/XP/ECO	ELECTRONIC BALLAST NO DIMMING	CEILING CHAIN SUSPENDED	N/A	
R1	WHITE	277/12	35	1.03	0.99	-	-	JUNO	TC43-432C-WH-277V-12V TRANSFORMER	1	35MR16FL40 (10-VOLT)	2ZY TRANSFORMER	RECESSED	5.5-IN	
S4	WHITE	120	34	0.90	0.98	0.13	0.13	ALKCO	SFLNCS150-048-ECB-RBW	1	F032R35/XP/ECO	ELECTRONIC BALLAST NO DIMMING	UNDERCABINET SURFACE	2-IN	
T1	WHITE	277	8	0.90	0.98	0.17	0.17	COLE	F157-277-SCL	1	CF7D9/35	ELECTRONIC BALLAST NO DIMMING	STAIR RECESSED	5-IN	
VID	WHITE	277	63	1.03	0.98	0.23	0.23	DAYOLITE	VCR-SCB-228T5-G-4-BLK-277-DM	2	FP28/35/ECO	LUTRON ECO-T823-277-2	CEILING RECESSED	5.75-IN	
V2D	WHITE	277	78	0.95	0.99	0.28	0.28	WYNONA LIGHTING	P1-L5-FT40-LSRD-SGW-DM	2	F40DU/35	LUTRON ECO-T540-277-2	CEILING SEMI RECESSED	N/A	
V3D	WHITE	277	79	1.38	0.98	0.29	0.29	DAYOLITE	WPP-C-SCB-2-32T8-F-LENGTH-W-277V-DM-INSIDE CORNERS PER PLANS	2	CONTINUOUS F032R35/XP/ECO	LUTRON ECO-T832-277-3	CEILING RECESSED	10.5-IN	
XA	STAINLESS STEEL	277	48	1.00	0.90	0.30	0.19	HADCO	V25-H-B-N-079H-H	1	LU50DMED	MAGNETIC HID BALLAST NO DIMMING	EXTERIOR WALL SURFACE	42-IN	
XB	BLACK	277	72	1.05	0.98	0.28	0.28	LITHONIA	WST-232TRT-MD-277	2	CF32D7E/N/35	ELECTRONIC BALLAST NO DIMMING	EXTERIOR WALL SURFACE	N/A	
XC	BLACK	277	62	1.00	0.90	0.35	0.22	LUBARK	HP-MP-PW-509W-277	1	LU50MED	MAGNETIC HID BALLAST NO DIMMING	EXTERIOR WALL SURFACE	N/A	
XD	BLACK	277	173	1.00	0.90	0.70	0.63	MAN STREET LIGHTING	HEAD: 4L200 POLE: #HARRISBURG SERIES	1	LU150S/ECO	MAGNETIC HID BALLAST NO DIMMING	EXTERIOR POLE	N/A	
XE	BLACK	277	298	1.00	0.90	0.43	1.20	HOLOPHANE (DURE STANDARD)	HEAD: #ES-250HP-37 POLE: #VY2320-CIS CROSSARM: #BHC481-CA	1	LU250PLUSECO	MAGNETIC HID BALLAST NO DIMMING	EXTERIOR POLE	N/A	
XF	BLACK	277	596	1.00	0.90	0.43	1.20	HOLOPHANE (DURE STANDARD)	HEAD: #ES-250HP-37 POLE: #VY2320-CIS CROSSARM: #BHC482-CA	1	LU250PLUSECO	MAGNETIC HID BALLAST NO DIMMING	EXTERIOR POLE	N/A	
XG	BLACK	277	51	1.08	0.98	0.11	0.11	ARCH LANDSCAPE LIGHTING	SP-05-228F-277-8K	2	CF28D7E/N/35	ELECTRONIC BALLAST NO DIMMING	EXTERIOR WALL RECESSED	7-IN	

MECHANICAL EQUIPMENT SCHEDULE										
Nicholas Kutchi										
EQUIPMENT TAG	DESCRIPTION	LOAD: HP [A]	VOLTAGE & PHASE	BRANCH CIRCUIT PROTECTION TRIP	SETS	BRANCH CIRCUIT SIZE AND TYPE				
						CONDUIT SIZE TYPE		CONDUCTORS No.	GROUND SIZE	
Mechanical Equipment										
P-AHU-1	COIL CIRCULATOR	1/2 HP	120/1	20A	1	3/4		2	#12	#12
P-AHU-2	COIL CIRCULATOR	1/2 HP	120/1	20A	1	3/4		2	#12	#12
P-AHU-5	COIL CIRCULATOR	1/3 HP	120/1	20A	1	3/4		2	#12	#12
AHU-1	ROOFTOP AHU	123 A	460/3	200A	1	1 1/2		3	1/0	#6
AHU-2	ROOFTOP AHU	86 A	460/3	175A	1	1 1/2		3	1/0	#6
F-4-1	AHU SUPPLY FAN	7.5 HP	460/3	15A	1	3/4		3	#10	#10
F-4-2	AHU SUPPLY FAN	2 HP	460/3	7A	1	3/4		3	#12	#12
CU-1	CONDENSING UNIT	44 A	460/3	60A	1	1		3	#6	#10
AHU-5	ROOFTOP AHU	169 A	460/3	225A	1	1 1/2		3	2/0	#6
ACU-1	DUCTLESS SPLIT INDOOR SYSTEM	0.7 A	120/1	15A	1	3/4		2	#12	#12
ACU-2	DUCTLESS SPLIT INDOOR SYSTEM	0.7 A	120/1	15A	1	3/4		2	#12	#12
ACU-3	DUCTLESS SPLIT INDOOR SYSTEM	0.7 A	120/1	15A	1	3/4		2	#12	#12
ACU-4	DUCTLESS SPLIT INDOOR SYSTEM	0.7 A	120/1	15A	1	3/4		2	#12	#12
ACU-5	DUCTLESS SPLIT INDOOR SYSTEM	0.7 A	120/1	15A	1	3/4		2	#12	#12
ACU-6	DUCTLESS SPLIT INDOOR SYSTEM	0.7 A	120/1	15A	1	3/4		2	#12	#12
ACU-7	DUCTLESS SPLIT INDOOR SYSTEM	0.7 A	120/1	15A	1	3/4		2	#12	#12
ACU-8	DUCTLESS SPLIT INDOOR SYSTEM	0.7 A	120/1	15A	1	3/4		2	#12	#12
ACCU-1	DUCTLESS SPLIT OUTDOOR SYSTEM	12.75 A	208/1	30A	1	3/4		2	#10	#10
ACCU-2	DUCTLESS SPLIT OUTDOOR SYSTEM	9.55 A	208/1	30A	1	3/4		2	#10	#10
ACCU-3	DUCTLESS SPLIT OUTDOOR SYSTEM	9.55 A	208/1	30A	1	3/4		2	#10	#10
ACCU-4	DUCTLESS SPLIT OUTDOOR SYSTEM	12.75 A	208/1	30A	1	3/4		2	#10	#10
ACCU-5	DUCTLESS SPLIT OUTDOOR SYSTEM	12.75 A	208/1	30A	1	3/4		2	#10	#10
ACCU-6	DUCTLESS SPLIT OUTDOOR SYSTEM	12.75 A	208/1	30A	1	3/4		2	#10	#10
ACCU-7	DUCTLESS SPLIT OUTDOOR SYSTEM	12.75 A	208/1	30A	1	3/4		2	#10	#10
ACCU-8	DUCTLESS SPLIT OUTDOOR SYSTEM	12.75 A	208/1	30A	1	3/4		2	#10	#10
EF-1	EXHAUST FAN	1/3 HP	120/1	20A	1	3/4		2	#12	#12
EF-2	EXHAUST FAN	1/3 HP	120/1	20A	1	3/4		2	#12	#12
EF-3	EXHAUST FAN	1 HP	460/3	3A	1	3/4		3	#12	#12
EF-4	EXHAUST FAN	1/2 HP	460/3	3A	1	3/4		3	#12	#12
EF-5	EXHAUST FAN	1/3 HP	120/1	20A	1	3/4		2	#12	#12
EF-6	EXHAUST FAN	1/4 HP	120/1	20A	1	3/4		2	#12	#12
F-VENT-1	VENT FAN	2 HP	460/3	7A	1	3/4		3	#12	#12
F-VENT-2	VENT FAN	1/2 HP	460/3	3A	1	3/4		3	#12	#12
F-VENT-3	VENT FAN	1/20 HP	120/1	20A	1	3/4		2	#12	#12
F-VENT-4	VENT FAN	5 HP	460/3	15A	1	3/4		3	#12	#12
CUH-1	CABINET UNIT HEATER	(2) @ 1/12 HP	120/1	15A	1	3/4		2	#12	#12
CUH-2	CABINET UNIT HEATER	1/30 HP	120/1	15A	1	3/4		2	#12	#12
CUH-3	CABINET UNIT HEATER	1/30 HP	120/1	15A	1	3/4		2	#12	#12
CUH-4	CABINET UNIT HEATER	1/30 HP	120/1	15A	1	3/4		2	#12	#12
CUH-5	CABINET UNIT HEATER	1/30 HP	120/1	15A	1	3/4		2	#12	#12
CUH-6	CABINET UNIT HEATER	1/30 HP	120/1	15A	1	3/4		2	#12	#12
CUH-7	CABINET UNIT HEATER	1/30 HP	120/1	15A	1	3/4		2	#12	#12
CUH-8	CABINET UNIT HEATER	1/20 HP	120/1	15A	1	3/4		2	#12	#12
CUH-9	CABINET UNIT HEATER	1/12 HP	120/1	15A	1	3/4		2	#12	#12
CUH-10	CABINET UNIT HEATER	1/6 HP	120/1	15A	1	3/4		2	#12	#12
CUH-11	CABINET UNIT HEATER	1/15 HP	120/1	15A	1	3/4		2	#12	#12
UH-1	UNIT HEATER	1/2 HP	460/3	20A	1	3/4		2	#12	#12
UH-2	UNIT HEATER	1/50 HP	120/1	15A	1	3/4		2	#12	#12
UH-3	UNIT HEATER	1/50 HP	120/1	15A	1	3/4		2	#12	#12
UH-4	UNIT HEATER	1/50 HP	120/1	15A	1	3/4		2	#12	#12
ATCC	ATC COMPRESSOR	2 @ 7.5 HP	460/3	30A	1	3/4		3	#10	#10
Plumbing Equipment										
P-HW-1	PUMP	15 HP	460/3	60A	1	3/4		3	#10	#10
P-HW-2	PUMP	15 HP	460/3	60A	1	3/4		3	#10	#10
P-AC-1	PUMP	2 @ 5 HP	460/3	30A	1	3/4		3	#10	#10
P-VP-1	PUMP	2 @ 5 HP	460/3	30A	1	3/4		3	#10	#10
P-DWH-1	PUMP	25 HP	480/3	30A	1	3/4		3	#10	#10
P-DWH-2	PUMP	2 HP	120/1	20A	1	3/4		2	#12	#10
P-DWH-3	PUMP	12.5 HP	480/3	30A	1	3/4		2	#12	#12
Architectural Equipment										
ELEVATOR-1	ELEVATOR	100 HP	480/3	200A	1	1 1/2		3	2/0	#6
ELEVATOR-2	ELEVATOR	100 HP	480/3	200A	1	1 1/2		3	2/0	#6

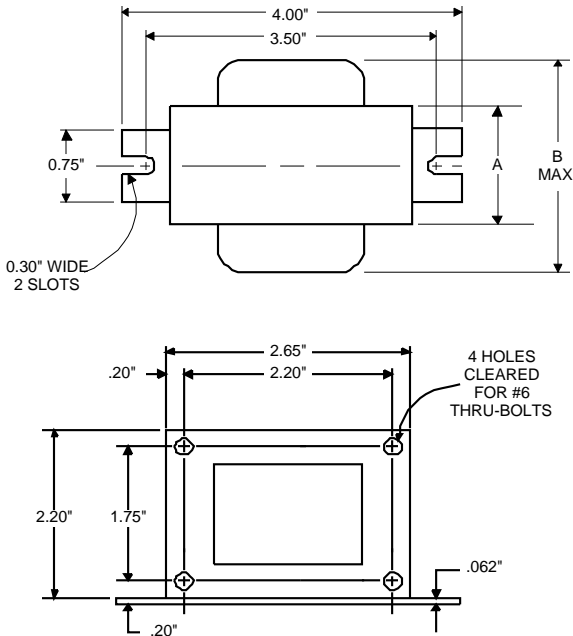


Metal Halide Lamp Ballast

Catalog Number 71A5037BP
For 35/39W M130
60 Hz R-HPF
Status: Active

DIMENSIONS AND DATA

2 5/8 X 2 3/16 CORE



INPUT VOLTS	277			
CIRCUIT TYPE	R-HPF			
POWER FACTOR (min)	90%			
REGULATION				
Line Volts	±5%			
Lamp Watts	±10%			
LINE CURRENT (Amps)				
Operating.....	0.19			
Open Circuit.....	0.52			
Starting.....	0.30			
UL TEMPERATURE RATINGS				
Insulation Class	H(180°C)			
Coil Temperature Code	1029	A		
MIN. AMBIENT STARTING TEMP.	-20°F or -30°C			
NOM. OPEN CIRCUIT VOLTAGE	277			
INPUT VOLTAGE AT LAMP DROPOUT.....	190			
INPUT WATTS	48			
RECOMMENDED FUSE (Amps).....	2			
CORE and COIL				
Dimension (A)	0.95			
Dimension (B)	2.70			
Weight (lbs.)	1.9			
Lead Lengths	12"			
CAPACITOR REQUIREMENT				
Microfarads	5.0			
Volts (min.)	280			
Fault Current Withstand (amps)				
60 Hz TEST PROCEDURES (Refer to Advance Test Procedure for HID Ballasts - Form 1270)				
High Potential Test (Volts)				
1 minute				
2 seconds	2000			
Open Circuit Voltage Test (Volts)	2500			
Short-Circuit Current Test (Amps)	260-290			
Secondary Current				
Input Current.....	0.50-0.80	0.10	-	-
		0.16	-	-

Capacitor: 7C050L33



Capacitance: 5
 Dia/Oval Dim: 1.25
 Height: 2.9
 Temp Rating: 105°C

Wiring Diagram:

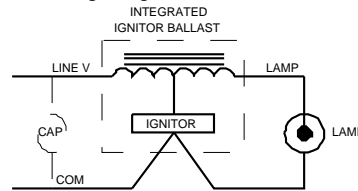


Fig. H

Ignitor: INTEGRAL

An ignitor integral to the core and coil assembly is used to start the lamp.

Ballast to Lamp Distance (BTL) = 2 feet
 Temp Rating: 125°C

Typical Ordering Information

(please call Advance for suffix availability)

Order Suffix	Description
500DB	Ballast With Integral Igniter and Dry Film Capacitor
510DB	Ballast w/Welded Bracket, Integral Igniter & Dry Film Cap.
600B	Ballast and Integral Igniter, No Capacitor
610B	Ballast w/Welded Bracket and Integral Igniter, No Capacitor

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

ADVANCE

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

12/14/05

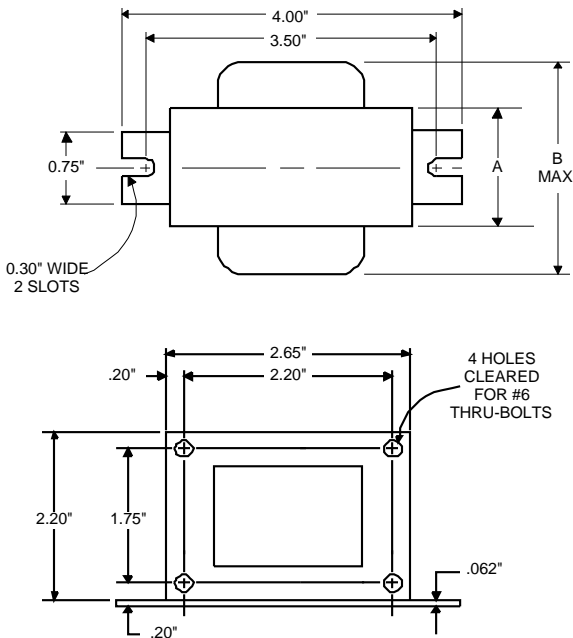


**Metal
Halide
Lamp Ballast**

**Catalog Number 71A5137BP
For 50W M110
60 Hz R-HPF
Status: Active**

DIMENSIONS AND DATA

2 5/8 X 2 3/16 CORE



INPUT VOLTS		277			
CIRCUIT TYPE	R-HPF				
POWER FACTOR (min)	90%				
REGULATION					
Line Volts	±5%				
Lamp Watts	±10%				
LINE CURRENT (Amps)					
Operating.....	0.22				
Open Circuit.....	0.55				
Starting.....	0.35				
UL TEMPERATURE RATINGS					
Insulation Class	H(180°C)				
Coil Temperature Code	1029	A			
MIN. AMBIENT STARTING TEMP.	-20°F or -30°C				
NOM. OPEN CIRCUIT VOLTAGE	277				
INPUT VOLTAGE AT LAMP DROPOUT.....	190				
INPUT WATTS	62				
RECOMMENDED FUSE (Amps).....	2				
CORE and COIL					
Dimension (A)	1.10				
Dimension (B)	2.60				
Weight (lbs.)	2.2				
Lead Lengths	12"				
CAPACITOR REQUIREMENT					
Microfarads	5.0				
Volts (min.)	280				
Fault Current Withstand (amps)					
60 Hz TEST PROCEDURES (Refer to Advance Test Procedure for HID Ballasts - Form 1270)					
High Potential Test (Volts)					
1 minute	2000				
2 seconds	2500				
Open Circuit Voltage Test (Volts)	260-290				
Short-Circuit Current Test (Amps)					
Secondary Current	0.65-0.95				
Input Current.....	0.25	-	-	-	-
	0.35				

Capacitor: 7C050L33



Capacitance: 5
Dia/Oval Dim: 1.25
Height: 2.9
Temp Rating: 105°C

Ignitor: INTEGRAL

An ignitor integral to the core and coil assembly is used to start the lamp.

Ballast to Lamp Distance (BTL) = 2 feet
Temp Rating: 125°C

Wiring Diagram:

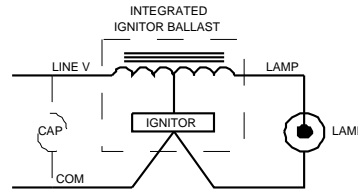


Fig. H

Typical Ordering Information

(please call Advance for suffix availability)

Order Suffix	Description
500DB	Ballast With Integral Igniter and Dry Film Capacitor
510DB	Ballast w/Welded Bracket, Integral Igniter & Dry Film Cap.
600B	Ballast and Integral Igniter, No Capacitor
610B	Ballast w/Welded Bracket and Integral Igniter, No Capacitor

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

ADVANCE

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

05/15/03

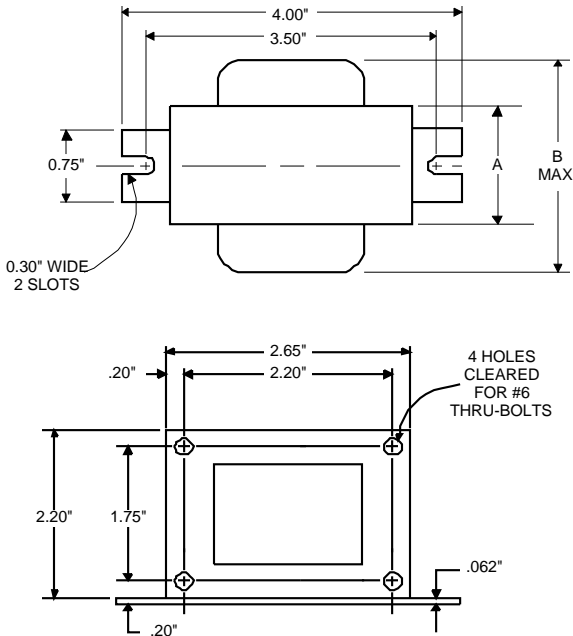


**Metal
Halide
Lamp Ballast**

**Catalog Number 71A5437BP
For 150W M102
60 Hz R-HPF
Status: Active**

DIMENSIONS AND DATA

2 5/8 X 2 3/16 CORE



INPUT VOLTS	277				
CIRCUIT TYPE	R-HPF				
POWER FACTOR (min)	90%				
REGULATION					
Line Volts	±5%				
Lamp Watts	±10%				
LINE CURRENT (Amps)					
Operating.....	0.63				
Open Circuit.....	1.50				
Starting.....	0.70				
UL TEMPERATURE RATINGS					
Insulation Class	H(180°C)				
Coil Temperature Code	1029	B			
MIN. AMBIENT STARTING TEMP.	-20°F or -30°C				
NOM. OPEN CIRCUIT VOLTAGE	277				
INPUT VOLTAGE AT LAMP DROPOUT.....	170				
INPUT WATTS	173				
RECOMMENDED FUSE (Amps).....	5				
CORE and COIL					
Dimension (A)	2.50				
Dimension (B)	4.00				
Weight (lbs.)	4.2				
Lead Lengths	12"				
CAPACITOR REQUIREMENT					
Microfarads	14.0				
Volts (min.)	280				
Fault Current Withstand (amps)					
60 Hz TEST PROCEDURES (Refer to Advance Test Procedure for HID Ballasts - Form 1270)					
High Potential Test (Volts)					
1 minute	2000				
2 seconds	2500				
Open Circuit Voltage Test (Volts)	250-305				
Short-Circuit Current Test (Amps)					
Secondary Current	2.00-2.50				
Input Current.....	0.50	-	-	-	-
	0.75				

Capacitor: 7C140M33-R



Capacitance: 14
Dia/Oval Dim: 1.5
Height: 2.9
Temp Rating: 105°C

Ignitor: INTEGRAL

An ignitor integral to the core and coil assembly is used to start the lamp.

Ballast to Lamp Distance (BTL) = 2 feet
Temp Rating: 125°C

Wiring Diagram:

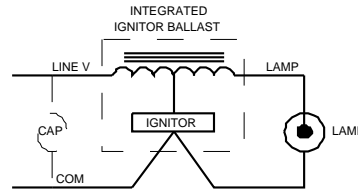


Fig. H

Typical Ordering Information

(please call Advance for suffix availability)

Order Suffix	Description
500DB	Ballast With Integral Igniter and Dry Film Capacitor
510DB	Ballast w/Welded Bracket, Integral Igniter & Dry Film Cap.
600B	Ballast and Integral Igniter, No Capacitor
610B	Ballast w/Welded Bracket and Integral Igniter, No Capacitor

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

ADVANCE

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

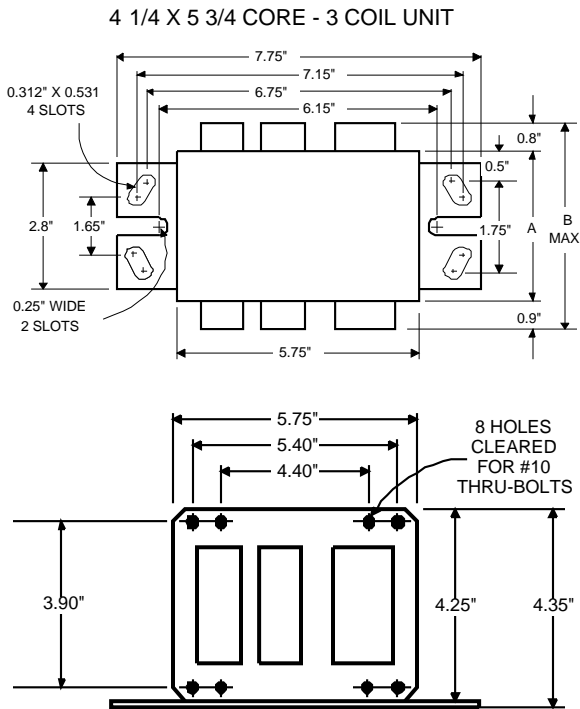
05/15/03



Metal Halide Lamp Ballast

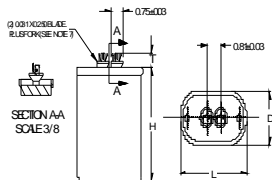
Catalog Number 71A5734
For 250W M138 (Pulse Start)
60 Hz REGULATED LAG
Status: Active

DIMENSIONS AND DATA



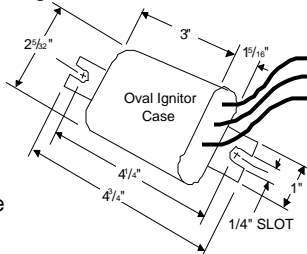
INPUT VOLTS	277			
CIRCUIT TYPE	REGULATED LAG			
POWER FACTOR (min)	90%			
REGULATION				
Line Volts	±10%			
Lamp Watts	±5%, -7%			
LINE CURRENT (Amps)				
Operating.....	1.20			
Open Circuit.....	1.00			
Starting.....	0.43			
UL TEMPERATURE RATINGS				
Insulation Class	H(180°C)			
Coil Temperature Code	A			
MIN. AMBIENT STARTING TEMP.	-40°F or -40°C			
NOM. OPEN CIRCUIT VOLTAGE	305			
INPUT VOLTAGE AT LAMP DROPOUT.....	195			
INPUT WATTS	298			
RECOMMENDED FUSE (Amps).....	3			
CORE and COIL				
Dimension (A)	2.50			
Dimension (B)	4.13			
Weight (lbs.)	16			
Lead Lengths	12"			
CAPACITOR REQUIREMENT				
Microfarads	16.0			
Volts (min.)	480			
Fault Current Withstand (amps)				
60 Hz TEST PROCEDURES (Refer to Advance Test Procedure for HID Ballasts - Form 1270)				
High Potential Test (Volts)				
1 minute	2000			
2 seconds	2500			
Open Circuit Voltage Test (Volts)	290-355			
Short-Circuit Current Test (Amps)				
Secondary Current	2.00-2.50			
Input Current.....	0.20	-	-	-
	0.30			

Capacitor: MD1606-000

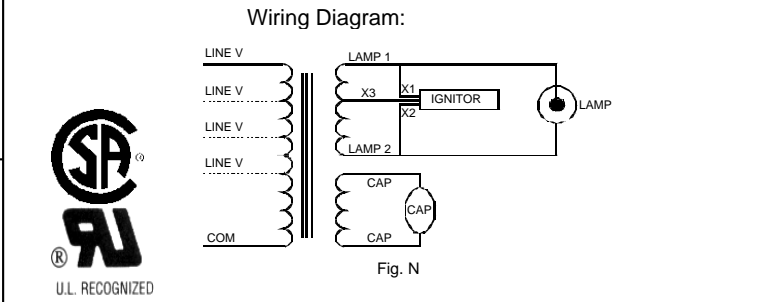


Capacitance: 16
 Dia/Oval Dim: 1.75
 Height: 3.4
 Temp Rating: 90°C

Ignitor: LI534-H5



Ballast to Lamp Distance (BTL) = 2 feet
 Temp Rating: 105°C



Typical Ordering Information

(please call Advance for suffix availability)

Order Suffix	Description
500.	Ballast with Ignitor and Oil Filled Capacitor
510.	Ballast w/Welded Bracket, Ignitor & Oil-Filled Capacitor
600.	Ballast and Ignitor, No Capacitor
610.	Ballast with Welded Bracket and Ignitor, No Capacitor

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

ADVANCE

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

09/03/97