

SECTION 26 09 33
CENTRAL DIMMING SYSTEMS
PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. The Conditions of the Contract and applicable requirements of Divisions 0 and 1 and Section 26 00 01, "Electrical General Provisions", govern this Section.

1.2 DESCRIPTION OF WORK:

- A. Work Included: The extent of dimming system work is as shown and scheduled, as indicated by the requirements of this Section, and as specified elsewhere in these Specifications.
- B. Types: The types of dimming systems required for the project include, but are not necessarily limited to, **[central] [architectural]** dimming and lighting control systems.
- C. Dimming System Summary: Provide Architectural Dimming and Control equipment as specified herein and as shown on the schedules and drawings. Installing contractor shall receive, place, connect, and mount all equipment specified in this Section per the manufacturer's instructions. Installing contractor shall furnish all hardware, wire, conduit, connectors, and other necessary items as required for a complete and functional lighting and control system.
- D. Dimming System Summary: **[The following information documents the general scope of dimming system work and is included as a general reference.] [Provide multi-scene preset dimming systems to [insert description].]** Refer to detailed Specifications, schedules and the Drawings for **[additional]** information and requirements.

[INCLUDE AND EDIT TO SUIT PROJECT, AS APPLICABLE]

AREA CONTROL TYPE

Conference Rooms

* Indirect Fluorescent	R/4S/MS
* General Downlights	R/4S/MS
* Wall Washers	R/4S/MS
* Screen Wall Washers	R/4S/MS
* Emergency Downlights	R/4S/MS/ER
* Exit Signs	NS

Auditorium

* Center Downlights	D/8S
* Side Downlights	D/8S
* Front Downlights	D/8S
* Track Lighting	D/8S
* Emergency Downlights	D/8S/ER
* Exit Signs	NS

Presentation Rooms

* Indirect Fluorescents	D/8S/MS
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- * Accent Lights D/8S/MS
- * Screen Wall Washer D/8S/MS
- * Front Wall Washers D/8S/MS
- * Side Wall Washers D/8S/MS
- * Fluorescent Emergency Lighting D/8S/MS
- * Exit Signs NS

Public Areas

- * Incandescent Lighting D/PC
- * Emergency Lighting D/PC/ER
- * Exit Signs NS

1. 1. Key to Dimming Control Codes:
 - a. R/4S Relay with local four scene preset.
 - b. R/4S/MS Relay with local four scene preset control and motion sensor on-off control.
 - c. R/4S/MS/ER Relay with local four scene preset control, motion sensor on-off control and emergency power override relay.
 - d. D/8S Dimmer with local eight scene preset control.
 - e. D/8S/ER Dimmer with local eight scene preset control and emergency power override relay.
 - f. D/8S/MS Dimmer with local eight scene preset control and motion sensor on-off control.
 - g. D/8S/MS/ER Dimmer with local eight scene preset control, motion sensor on-off control and emergency power override relay.
 - h. NS Nonswitched circuit.
2. Control Specifics: The general control types for areas with dimming control systems are summarized as follows:
 - a. Conference Rooms: Lighting will be dimmed with separate control zones for indirect fluorescents, general downlights, general wall washers and screen wall washers. Upon entering an unoccupied room, a motion sensor will automatically activate the indirect fluorescent fixtures to provide general illumination. Eight scenes of lighting levels by control zone will be controlled from pushbutton scene selector panels in the adjacent Audio/ Video Room and at the []. When the room has been unoccupied, as detected by the motion sensor, for approximately 10 minutes (adjustable), the room lights shall automatically turn off. Upon loss of power in the building, the emergency lights in the room shall automatically turn on at full brightness, regardless of the control scene selected.
 - b. Auditorium: Lighting will be dimmed with separate control zones for front downlights, center downlights side downlights and track lighting. Eight scenes of lighting levels by control zone will be controlled from pushbutton scene selector panels in the Auditorium Audio/Visual Room and adjacent to the podium. Room lights will be turned off from the scene selector panels. Upon loss of power in the building, the

emergency lights in the room shall automatically turn on at full brightness, regardless of the control scene selected.

- c. Presentation Rooms: Lighting will be dimmed with separate control zones for indirect fluorescents, accent lights, screen wall washers, front wall washers, and side wall washers. Upon entering an unoccupied room, a motion sensor will automatically activate the general indirect fluorescents at a preset level to provide general illumination. Eight scenes of lighting levels by control zone will be controlled from pushbutton scene selector panels in the adjacent Audio/Visual Room and at the []. When the room has been unoccupied, as detected by the motion sensor, for approximately 10 minutes (adjustable), the room lights shall automatically turn off. Upon loss of power in the building, the emergency lights in the room shall automatically turn on at full brightness, regardless of the control scene selected.
- d. Public Areas: Lighting will be dimmed/switched with separate control zones for incandescent fixtures. Lighting groups will be provided with time based on-off and lighting level control via microprocessor time program control. Upon loss of power in the building, the emergency lights in public areas shall go to full brightness, regardless of the program control mode.

1.3 QUALITY ASSURANCE:

- A. Manufacturers: Provide [Lutron Orion] [Lightolier Lytemode] products or an approved equal complying with these specifications and produced by one of the following:
 - 1. Colortran.
 - 2. Lightolier, Inc.
 - 3. Lutron Electronics Company, Inc.
 - 4. Macro.
 - 5. Prescolite, Inc. [Architectural Dimming Only]
 - 6. Strand.
- B. UL Label: All dimming system products shall be UL labeled, individually and as a system for the specific applications utilized on this project.
- C. Factory Testing:
 - 1. All individual modules shall be fully tested for operation with any possible system configuration.
 - 2. All power handling components shall be tested at maximum temperature and at full voltage for a minimum of five hours before shipment.
- D. Warranty: Lighting Controls [and Ballasts] shall be provided with a [~~one (1)~~] [two (2)] year parts and labor warranty from the date of project acceptance.

1.4 ACCEPTABLE MANUFACTURERS

- A. Genlyte Controls - Lightolier Controls (LOLC)
- B. The listing of a manufacturer as acceptable does not imply automatic approval. It is the sole responsibility of the electrical contractor to ensure compatibility of submitted products to other sections of the specification.

- C. Substitutions: Exceptions to the specifications are not acceptable. No substitutions permitted.

1.5 REFERENCES.

- A. The General Conditions, Supplementary Conditions, and Division 1 Specifications shall apply to all work of this section.
- B. Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title, or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.
- C. Underwriter's Laboratories (UL)
 - 1. UL 508 Industrial Control Equipment
 - 2. UL 891 Dead-Front Switchboards
- D. United States Institute for Theatre Technology (USITT)
 - 1. USITT DMX512/1990 Digital Data Transmission Standard for Dimmers and Controllers
- E. Institute of Electronic and Electrical Engineers (IEEE)
 - 1. IEEE 802.3 CSMA/CD (ETHERNET)
- F. Society of Motion Picture & Television Engineers (SMPTE)
 - 1. SMPTE Time Code

1.6 WARRANTY

- A. Manufacturer's Warranty: All equipment provided under this section is warranted for three (3) years from Substantial Completion or System Commissioning, whichever occurs first.
- B. Project Warranty: All installation shall be fully guaranteed by the Installer for a period of one (1) year from Substantial Completion covering installation and resulting equipment defects or damage.
- C. The manufacturer shall have produced similar lighting control equipment for at least twelve (12) consecutive years.

1.7 SUBMITTALS:

- A. Shop Drawing submittals shall include, but not be limited to, the following:
 - 1. Submit manufacturer's product data on all dimming system components and accessories.
 - 2. Dimming system load schedules which indicate a clear understanding of the actual loads and functional types per circuit, which circuits are on their respective control zones, which circuits which have emergency transfer, and the corresponding circuit numbers from the contract drawings.
 - 3. An interconnection diagram showing a detail of each control, which zones are on that control, the interconnect wiring between controls, programming jacks and lighting control panels, and between dimming panels. Block diagrams involving cross-referencing to catalog specification/application sheets will not be acceptable.

4. Factory-testing procedures for the dimming system.
5. Dimming system panel shop drawings clearly showing all major panel components, dimensions, heat loads and weights.
6. Additional information as required in Section 26 00 01, "Electrical General Provisions".

1.8 SUBMITTALS

- A. General: Submit listed Submittals in accordance with Conditions of the General Contract and Division 1 Submittal Procedures Section.
- B. Product Data: Submit product data, including manufacturer's data sheets for all proposed system components. Submit three (3) copies with all specific items that will be provided clearly indicated and the options highlighted.
- C. Shop Drawings: Complete system Shop Drawings shall be prepared for this particular project which include device layout based on the building floor plan, point-to-point wiring diagram(s), and conductor sizes and types. Submit three (3) copies to the Architect / Engineer / Consultant / Owner for review and approval. Layout shall be based on an actual building floor plan provided by the Architect or Engineer as well as diagrammed for system clarity. Drawings shall show all equipment locations and quantities required. A final "as-built" plan layout shall be provided to the Owner upon Substantial Completion of the actual installation. Installing contractor shall coordinate any recessed equipment with the General Contractor.
- D. Materials List: Submit a complete materials list indicating all equipment to be provided as part of this section.
- E. Samples: Submit selection and verification samples of finishes, colors, and textures as requested.

1.9 APPROVALS

- A. Deviations from this specification must be documented in writing to the Architect and Engineer at least ten business days prior to the bid date.
- B. Complete catalogue data, product specifications, and technical information on alternative equipment must be provided including all associated cost savings or additions, including but not limited to equipment, equipment installation, power wiring and materials, programming, documentation, and project management.

1.10 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Store assembled dimming system components in a clean dry space.
- B. Handle dimming system components to avoid damage to components, enclosure, and finish.

1.11 DELIVERY & HANDLING

- A. General: Comply with Division 1 Product Requirements Section.
- B. Delivery: Deliver Materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Storage and Protection: Store materials and equipment in an area protected from harmful weather conditions and at temperature conditions recommended by manufacturer. After initial installation, protect equipment from exposure to dust, dirt, paint, and other contaminants.

1.12 PROJECT CONDITIONS

- A. **Field Measurements:** Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings.
- B. **Scheduling:** Coordinate taking field measurements, fabrication schedule, and deliveries with construction progress schedule to avoid construction delays.

PART 2 - PRODUCTS

[BASED ON LUTRON ORION SYSTEM]

[EDIT TO SUIT PROJECT]

2.1 CENTRAL DIMMING AND LIGHTING CONTROL SYSTEMS:

- A. **General:** Provide a complete central dimming and lighting control system to control building[, garage and site lighting] as shown on the Drawings and specified herein. System shall include, but not be limited to: factory pre-assembled lighting control cabinets, microprocessor control panels, personal computer user interfaces, low voltage control stations, occupancy sensors, fluorescent lamp dimmer packs and related components, accessories, and wiring.
- B. **Dimming Cabinets:**
 - 1. Cabinets shall be wall or floor mounted NEMA 1 grade, constructed of sheet steel plates not less than #14 US gauge. Contractor shall reinforce wall as required for wall mounted panels.
 - 2. Cabinets shall be completely prewired by the manufacturer. The contractor shall be required to provide input feed wiring, load wiring, and control wiring which terminates to a set of clearly marked low-voltage terminals. No other wiring or assembly by the Contractor shall be permitted. Panel input voltage and ampacity shall be as scheduled or shown on the Drawings. Panel main breakers and busing shall be as scheduled. Manufacturers shall phase balance panel loads in each panel, to the maximum extent possible.
 - 3. Cabinets shall contain input and output circuit breakers to provide primary line side protection and outgoing branch circuit protection for each dimming module. Circuit breakers shall be designed to trip within 9 milliseconds after a 400 ampere surge. Circuit breakers shall contain a visual trip indicator and shall be rated at 10,000 AIC (120 volt) or 14,000 AIC (277 volt), as applicable.
 - 4. Cabinets shall contain current carrying terminals with factory installed brass or copper jumpers or bypass switches. These jumpers or switches shall enable power to completely bypass the dimmer and relay modules for temporary power during installation and any future service work. Bypass jumpers or switches shall be clearly and permanently labeled and shall be reusable at any time. Low voltage control signal methods of bypass shall not be acceptable.
 - 5. Cabinets shall be cooled exclusively by means of free convection, unaided by fans, in an ambient temperature range of 0°C (32°F) to 40°C (104°F). To provide the utmost in reliability, cabinets which normally use cooling fans must have their capacity derated accordingly, and as such may require either larger panels or a greater number of panels than shown on the Drawings. Panels must fit in the space allocated on the Drawings.

C. Dimming and Relay Lighting Control Modules:

1. Silicon thyristors shall be used to control the power furnished to dimmed loads. The complete load current shall be carried by these devices. They shall be capable of withstanding surges, without impairment to performance, of 6000 volts, 3000 amps as specified by IEEE Standard 587-1980. In addition, under fully loaded operating conditions, all devices shall operate at a minimum 20°C safety margin below the component temperature rating.
2. A positive air gap relay shall be employed with each dimmer module to ensure that the load circuits are open when the "off" function is selected by the control system. Use of semiconductors to accomplish this result shall not be acceptable. These relays need not be integral to the dimmer module, but must be integral to the lighting control cabinet. Manufacturer shall provide both the relays and the necessary control interfaces as part of the lighting control system.
3. All dimming modules shall be voltage regulated so that $\pm 10\%$ change in line voltage shall cause no more than $\pm 3\%$ change in output voltage.
4. All dimming modules shall provide a smooth and continuous Square Law dimming curve throughout the entire dimming range.
5. All dimmers designed for use with inductive loads shall include the following additional features:
 - a. The maximum allowable asymmetry in the load waveform shall be ± 1 volts dc.
 - b. The dimmer shall incorporate circuitry to prevent the lights from momentarily "flashing" when the dimmer is turned on or off.
6. Quantities and sizes of each type of lighting control module shall be provided to control each type of load shown on the load schedule and/or the drawings.
7. Incandescent and Low Voltage:
 - a. Filtering shall be provided in each dimmer so that current rise time shall be at least 350 microseconds at 50% rated dimmer capacity as measured from 10% to 90% of the load current wave form at a 90 degrees conduction angle, and at no point rise faster than 30mA/ microsecond. Manufacturers should note that additional filters may be required to meet this specification. These filters need not be integral to the dimming module, but must be integral to the lighting control cabinet.
 - b. Dimming performance shall not adversely affect sound rating of electronic low voltage "transformers". In addition, no flicker or interaction shall occur at any point in the dimming range.
 - c. Modules shall provide a dimming range from 100% to 0% (blackout). Minimum light levels shall be user adjustable in order to compensate for different loading of each dimmer module.
8. **[Fluorescent - Solid-state Dimming Ballast: Solid-state dimming ballast fluorescent modules shall be rated to control 430 mA rapid start (3', 4') and compact fluorescent lamps at 120 volt ac. Dimmer packs for fluorescent fixtures shall be Lutron Hi Lume "OSPCU" series or Advance solid state dimming ballasts.]**

- a. [The dimming performance shall be as follows:]**
- 1) **[Dimming range from 100% to [1%] light output.]**
 - 2) **[One- and two-lamp ballasts shall track evenly, with no perceptible difference in light levels between lamps.]**
 - 3) **[Different lamp lengths on the same circuit shall track evenly, with no perceptible difference in light levels for the same type lamps.]**
 - 4) **[Fixture packs and, where required, supplementary ballasts shall be inaudible with no apparent humming or buzzing at any point in the dimming range.]**
 - 5) **[Standard lamps shall be used. Energy-saver krypton-fill gas lamps are not acceptable. Where applicable, knife-edge lamp sockets shall be used.]**
 - 6) **[No electrical noise shall be generated which could interfere with any other properly installed electrical equipment.]**
 - 7) **[Minimum light levels shall be user-adjustable in order to compensate for different loading of each dimmer module. A 0% control input from any control station shall turn the respective dimmer "off" completely.]**
 - 8) **[Lamps shall operate without flicker or striations at any light level in the specified range.]**
 - 9) **[Pack power factor shall be 90% or greater and input current harmonic content shall not exceed [5%] [10%] [25%.]**
 - 10) **[Where applicable to the lamp type, filaments shall be preheated before lamps are energized to increase lamp life.]**
- b. [Provide fluorescent lamp dimmer packs for installation and wiring at the light fixture manufacturers' facilities. Dimmer manufacturer shall provide complete fixture pack installation, wiring, and lamp socket requirements to lighting fixture manufacturer with packs. Dimmer packs shall be provided for the following lamp types:]**
- 1) **[Standard F40 T12, 36" and 48" fluorescent lamps (430 mA) with 120 volt input. Dimmer pack replaces one or two lamp ballast.]**
 - 2) **[Twin-tube T5, biaxial 22", 40 watt compact fluorescent lamps with 120 volt input. Dimmer pack replaces one or two lamp ballast.]**
 - 3) **[Four pin, quadtube, 26 watt compact fluorescent lamps with 120 volt input. Dimmer pack shall supplement one or two standard Advance LPF ballasts.]**

9. **[Fluorescent (Magnetic Dimming Ballast):** Fluorescent modules shall be rated to control 430 mA rapid start (3', 4') lamps. The ballasts used shall be approved by the dimming manufacturer. The modules shall provide a dimming range from 100% to 5% (120 volts ac), 100% to 10% (277 volts ac) of light output. Minimum light levels shall be user-adjustable in order to compensate for different loading of each dimmer module. A 0% control input from any control station shall turn the respective dimmer "off" completely.]
- a. **[Electrical Contractor shall ensure the following installation parameters are followed:]**
- 1) **[Special lamp disconnect sockets are provided in order to maintain UL listing of dimming ballasts.]**
 - 2) **[30 watt and 40 watt lamps are circuited separately and placed on separate dimmers, for even tracking.]**
 - 3) **[One and two-lamp ballasts are circuited separately and placed on separate dimmers, for even tracking.]**
 - 4) **[Standard lamps shall be used. Energy-saver lamps are not acceptable.]**
- b. **[Fluorescent Conventional Ballast (430 mA Rapid Start):** Fluorescent module shall be rated to control 430 mA rapid start 4' lamps using conventional ballasts. The ballasts used shall have been tested and approved for the use with these modules by the dimming manufacturer. The module shall provide a dimming range from 100% to 40% of light output. Special electronic circuitry shall be employed to keep lamp cathode voltages high and current crest factors low to ensure proper lamp life in accordance with ANSI specifications. Standard SCR/Triac phase control technology is not acceptable; manufacturer shall provide brief explanation of how dimmers operate to meet above performance criteria. Lamp-to-lamp uniformity shall be maintained throughout the dimming range. Special lamp disconnect sockets shall not be permitted; standard sockets are acceptable. Where indicated on the dimming load schedule, provide extended dimming range (XR) option using G.E. Maximiser II two-lamp ballasts with a corresponding dimming range from 100% to 20% light output. Contractor is responsible for coordination of proper ballast in fixture.]
- c. **[Fluorescent Conventional Ballast (Slimline):** Fluorescent module shall be rated to control slimline instant-start 8' lamps using conventional ballasts. The ballasts used shall have been tested and approved for the use with these modules by the dimming manufacturer. The module shall provide a dimming range from 100% to 50% of light output. Standard SCR/Triac phase control technology is not acceptable; manufacturer shall provide brief explanation of how dimmers operate to meet above performance criteria. Lamp-to-lamp uniformity shall be maintained throughout the dimming range. Special lamp disconnect sockets shall not be permitted, standard sockets are acceptable. Contractor is responsible for coordination of proper ballast in fixture.]

- d. **[Fluorescent Conventional Ballast (800 mA High Output):** Fluorescent module shall be rated to control 800 mA high output 8' lamps using conventional ballasts. The ballasts used shall have been tested and approved for the use with these modules by the dimming manufacturer. The module shall provide a dimming range from 100% to 50% of light output. Special electronic circuitry shall be employed to keep lamp cathode voltages high and current crest factors low to ensure proper lamp life in accordance with ANSI specifications. Standard SCR/Triac phase control technology is not acceptable; manufacturer shall provide brief explanation of how dimmers operate to meet above performance criteria. Lamp to lamp uniformity shall be maintained throughout the dimming range. Special lamp disconnect sockets shall not be permitted, standard sockets are acceptable. Contractor is responsible for coordination of proper ballast in fixture.]
- 10. **[HID-Mercury Vapor (Solid-State Dimming Ballast):**
 - a. The module shall provide a dimming range from 100% to 5% light. 80% of intensity change shall be almost instantaneous. Light level shall complete full change within one minute.]
 - b. [System shall consist of a remote, solid-state dimming ballast located within dimming panel. This remote ballast shall maintain proper lamp operating conditions throughout entire dimming range. Lamp-to-lamp uniformity shall be maintained with lamps of same age.]
 - c. [Provide HID lamp dimmer packs for installation and wiring at the light fixture manufacturers' facilities. Dimmer manufacturer shall provide complete fixture pack installation, wiring, and lamp socket requirements to lighting fixture manufacturer with packs.]
- 11. **[HID-Metal Halide/High Pressure Sodium (Conventional Ballast):]**
 - a. [HID module shall be rated to control standard CWA ballasted metal halide or high pressure sodium load. The ballasts used shall have been tested and approved for use with these modules by the dimmer manufacturer. The module shall provide a dimming range from 100% to 35% light. Special electronic circuitry shall be employed to keep current crest factors low and peak lamp arc voltages low to ensure proper lamp life. Dimming module shall recognize line drop outs greater than 2 milliseconds and shall re-strike lamps at full to prevent lamp arc from extinguishing and re-striking in a dimmed mode. Standard SCR/Triac phase control technology is not acceptable; manufacturer shall provide a brief explanation of how dimmers operate to meet above performance criteria. Lamp-to-lamp uniformity shall be maintained throughout the entire dimming range. Contractor is responsible for coordination of proper ballast and lamp in fixture and shall ensure that different type and wattage lamps are circuited separately and placed on separate dimmers for even tracking. Lamps shall be installed base up or base down only.]

b. [Maximum and minimum light levels are user-adjustable to compensate for different loading on each dimmer module as well as the custom nature of each ballast/lamp combination.]

12. Neon/Cold Cathode:

- a. Neon/Cold cathode dimmers shall be rated to control neon or cold cathode lighting loads. Each dimmer shall provide a dimming range from full light output to 10% of full light output. Modules shall be specifically UL listed for these loads and the performance shall be provided for normal (low) power factor transformers. The lamp performance over the range specified shall be continuous and free of flicker or striations. Neon/Cold cathode lamps shall be manufactured with strict attention paid to proper lamp pressurization and exclusion of any impurities to ensure proper dimming performance. Transformers shall be loaded to a maximum of 80% of the maximum rated undimmed load to ensure best dimming performance. Contractor is responsible for proper neon or cold cathode lamp and wiring installation.
- b. Maximum and minimum light levels are user-adjustable to compensate for different loading on each dimmer module as well as the custom nature of neon and cold-cathode lamps.

13. Non-dim Relay-switched Loads:

- a. Non-dim relay modules shall be rated to switch either tungsten or inductive loads. Relays shall be of the mechanically-held, positive air-gap type, and shall be rated to carry at least twice the actual connected load.
- b. When used with a preset control system, the modules shall turn off and on positively at the start of the light level transition period.
- c. [Where relay switched non-dimmed modules are shown for control of circuits with an Alternate Bid to provide dimmer modules, the Base Bid lighting control cabinets with relay switched non-dimmed modules shall be sized and designed such that these circuits can be changed from non-dimmed to dimmed in the future with only a module change (and ballast change for fluorescent circuits) and no other modifications to the lighting control panel.]
- d. Non-dimmed modules for audio/visual system interface shall provide output contacts as required to interface with controls for the electrically operated screens provided on the project. Screen up or screen down shall be programmable for each room preset.

14. Motor-driven Loads:

- a. The motor module shall be rated and UL listed to control up to 1 hp motor load by switching between the forward winding and common, or the reverse winding and common. Switching configuration shall be SPDT so that it is impossible to signal motor to both raise and lower at the same time. Each motor shall have a separate SPDT contact; multiple motors shall not be paralleled.

D. Emergency Full on System:

1. All circuits listed as emergency shall be connected to the respective circuit breakers in the emergency lighting control panel as shown on the drawings and/or dimming load schedule. They shall be controlled simultaneously with other lighting circuits within that control zone during the presence of normal utility power. Upon loss of normal power and

the subsequent presence of emergency power, the circuits listed as emergency shall immediately go to a full on condition. All local control stations are inoperable during this period. Once normal power is restored, all lighting zones shall revert back to their status prior to the emergency condition. Restoration to some other "default" level is not acceptable. The emergency full on mechanism shall be accomplished as follows:

- a. [Control Input Switching: The emergency electronics shall switch both the intensity signal and on/off signal of each emergency lighting control module from local control station/central processor control to a full on constant signal originating at the lighting control panel where the module is installed. All emergency lighting control modules shall be located in Emergency Dimming Panels which are powered from building emergency power system automatic transfer switches. Loss of normal power sensing the emergency power control input switching shall be obtained by monitoring all three phases of the power input to the normal power Lighting Control Panel which pairs with the Emergency Dimming Panel].
- b. [Load Power Switching: The emergency electronics switch both the hot and neutral leg of each emergency circuit between the dimmer output and the emergency feed via a two-pole, double throw emergency transfer relay per emergency circuit. These transfer relays shall be UL 1008 listed as emergency transfer relays, and shall be the only type of relay acceptable for load power switching of emergency circuits. This type of emergency full on may be used with either a normal/emergency generator feed, a constant hot secondary utility feed, a UPS system, or an emergency only feed. An individual 20 amp circuit is required from the dimming panel to the Emergency Bypass Panel (EBP) per emergency circuit.]

E. Control System:

1. The central lighting control system shall be controlled by one or more programmable microprocessor controllers with input/user interface from the following devices:
 - a. A desk mounted keyboard/monitor located in the Security Dispatch Room and capable of programming and controlling the entire lighting control system.
 - b. A laptop Personal Computer (PC) connected to the system via programming jacks located as shown on the Drawings and capable of programming and controlling the entire lighting control system.
 - c. Wall type control stations located as shown on the Drawings and controlling zones of lighting as programmed from a system monitor or PC.
 - d. Occupancy sensors located as shown on the Drawings and programmed for space lighting on/off control from a system monitor or PC.
2. The lighting control system shall provide preset control or timer based control for all control zones. Preset control shall be activated from wall control stations, occupancy sensors or a system PC and timer based control shall be from the system programmable controllers as programmed from a system monitor or PC.
3. Controls shall be low voltage type as specified here and as listed below and/or shown on the drawings. Controls shall use low voltage Class II wiring, electrically isolated from power wiring by means of a UL listed Class II transformer. A separate set of terminals shall be provided for each control station termination at the dimming panel and/or interface panels.

4. Each area shall function independently of other areas. Preset control shall provide full flexibility of each zone in each scene of intensity from 0% to 99%; fade rate from 0-99 seconds or minutes; and fade delay from 0-99 seconds or minutes. There is no limit to the number of zones and scenes in one area.
5. The wiring of the central control center shall be fully multiplexed, utilizing separate control links from power links. Wallstations in different areas shall be capable of being placed on one link. Lighting shall remain at current levels if link is disrupted, and a discrete contact closure can be provided to take lights to a default scene if so desired for specific areas.
6. The control center shall have a full internal battery backup (no floppy disk or tapes necessary) storing preset values without power for a minimum of 10 years and this shall be a nonvolatile memory that returns to previous state when power is restored. All memory storage devices shall be protected by a severe isolation transformer.
7. Programming (set-up) of system can be accomplished by either a keyboard and monitor, or laptop PC. No programming device is necessary for the actual operation of the system.
8. Keyboard and monitor shall utilize alphanumeric commands with help screens at all levels for ease of setup. Keyboard and monitor shall make zone identification easier by flashing desired zones, and shall be capable of providing entire system status without change of screen.
9. A laptop (PC) and associated software shall be provided for remote programming of the system from any system programming jack.
10. The control center shall provide timeclock capability with 14 schedules (seven daily, seven special) per area with 255 events per schedule. These events can be used to activate a scene or enable/ disable any wallstation. Commands can be in either real time or astronomic, relating to sunrise/ sunset times. Timeclock shall automatically correct for Daylight Savings and leap year where appropriate.
11. The control center shall provide the ability to enable/disable any wallstation. This command can originate from the keyboard and monitor, laptop PC, or another wallstation.
12. Wall control stations shall be provided in locations where shown on the Drawings. Control stations shall have the following construction and features:
 - a. Faceplates shall be machined from a single piece of 1/8" thick metal base (minimum). Unless noted otherwise, finish shall be clear brushed aluminum in Audio/Visual Rooms and bronze in all other areas where exposed. Bronze controls shall be machined using a single piece of solid brass with finish as selected by the Architect. Painted controls shall be painted by manufacturer to exactly match Architect's sample. Paint shall be a polyurethane enamel type equal to Polane™ in quality.
 - b. Faceplates shall attach to the wallbox using no visible means of attachment. To prevent unauthorized faceplate removal, set screws through the edge of the faceplate shall securely hold the faceplate to the switchbox.

- c. Controls shall be engraved with appropriate zone and/or scene descriptions, furnished to the manufacturer prior to fabrication. Size and style of engraving type shall be determined by the Architect. Any silk-screened borders, logos, graduations, etc. shall use a graphic process that chemically bonds the graphics to the metal faceplate, resisting removal by scratching, cleaning, etc.
- d. All control stations shall provide power-failure memory. Should power be interrupted to the control station and subsequently returned, the lights will come back on to the same levels set prior to the power interruption. Restoration to some other default level is not acceptable, unless specifically noted on the Drawings.
- e. Wall control stations shall be provided as follows and as shown on the Drawings.
 - 1) Type "4S": A four scene preset controller with four "scene" buttons with green LED indicators and an "off" button.
 - 2) Type "8S": An eight scene preset controller with eight "scene" buttons with green LED indicators and "off" button.
- 13. Wall mounted programming input jacks shall be provided at locations where shown on the Drawings. Program jacks shall have construction and features similar to wall control stations. Faceplates shall be clean-brushed aluminum in Audio/Visual Rooms and bronze in all other areas where exposed. Faceplates shall be engraved to indicate function. Programming jacks in Audio/Visual Rooms may be integrated with control stations.
- 14. Occupancy sensors shall be provided where scheduled or shown on the Drawings to activate preset scene one when an occupied state is sensed. The preset and off buttons shall remain activated. When the space is no longer occupied as sensed by the occupancy sensor, the lighting shall be turned off. Refer to "Occupancy Sensor Lighting Controls" hereinbelow for sensor requirements.

F. General Requirements:

- 1. All components used in the lighting control system shall be inspected following Military Standard 105D or equivalent.
- 2. Dimming module main power semiconductors shall be 100% tested at a case temperature of 100° C and with rated voltage applied for a minimum of 48 hours.

G. Factory-Testing:

- 1. The entire lighting control system shall be assembled at the factory and operated at full load and shall then be subjected to the manufacturer's full standard factory-testing to verify that the system is fully operation and that all control functions operate as specified.
- 2. The manufacturer's standard factory-test criteria shall be submitted to the Engineer for review and the Engineer shall be notified a minimum of one month prior to the factory-test so that an Owner's representative can witness the operational test. These tests shall be conducted in Houston, Texas, or Contractor shall pay for air fare, accommodations, and similar expenses, so that the Owner's representative can witness the test.

[BASED ON LIGHTOLIER LYTEMODE SYSTEM]

[EDIT TO SUITE PROJECT]

2.2 ARCHITECTURAL DIMMING AND LIGHTING CONTROL SYSTEMS:

- A. General: Provide a complete architectural dimming and lighting control system to control [Auditorium and Board Room] lighting as shown on the Drawings and specified herein. Systems shall include, but not be limited to: factory pre-assembled dimming cabinets, master control stations, remote control stations and related components, accessories, and wiring. Systems shall be designed for 120/208 volt input to dimming cabinets and 120 volt input to master control stations.
- B. Dimming Cabinets:
1. Cabinets shall be wall mounted NEMA-1 grade, constructed of sheet steel plates not less than #14 US gauge. Contractor shall reinforce wall as required for wall mounted panels.
 2. All equipment to be contained in the cabinet shall be provided with all internal wiring completed by the manufacturer, tested for proper operation and arranged in a neat, orderly manner.
 - a. Cabinets and dimmer modules shall be provided separately to facilitate the installation of the cabinets.
 - b. Dimmer control wiring shall be terminated by plug-in connections to facilitate installation, maintenance and repair operations. All components, terminal strips and apparatus shall be properly identified and labeled for ease of installation and maintenance.
 - c. Cabinets shall employ dimmer-to-channel assignment matrices so that dimmers may be assigned to any channel without removing the cabinet cover.
 3. Cabinet shall be constructed as one unit with all necessary support and clearance for all devices (dimmers, non-dim modules, breakers, etc.) required for a complete system. Covers shall be provided so that all dimmers and components are serviceable or removable from the front of the cabinet. Adequate space for all contractor wiring shall be provided. Main-feed and line voltage wiring may enter cabinet from top, sides and/or bottom of cabinet.
 4. Cabinets shall be cooled exclusively by means of free convection, unaided by fans, and shall operate in an ambient temperature range of 0 to 40° C(32-105° F). Cabinets which require mechanically aided ventilation, such as fans, shall not be acceptable.
 5. Cabinets shall contain a main circuit breaker and input circuit breakers to provide protection for each dimming module. Circuit breakers shall be designed to trip within 8 milliseconds after a 400 ampere surge. Circuit breakers shall contain a visual trip indicator and shall be rated at 10,000 AIC.
- C. Dimmer Modules:
1. Silicon Controlled Rectifiers shall be used to control the power furnished to the loads. The complete load current shall be carried by these devices. They shall be capable of withstanding surges, without impairment to performance, of 6000 Volts, 3000 Amps as specified by IEEE Std. 587-1980. In addition, under fully loaded operating conditions, all

- devices shall operate at a minimum 20 degrees Celsius safety margin below the component temperature rating.
2. Dimmers shall be designed for a supply line voltage of 120 volts, 60 Hz, alternating current.
 3. Dimmers shall respond to allow voltage, DC control signal of 0 to 10 volts. Performance shall not vary by more than 2 per cent from dimmer to dimmer using a common control signal. Dimmers shall operate without phase sensitivity with respect to the control signal or upon which phase the dimmer operates. The control circuit shall be completely isolated from the power circuit.
 4. Dimmers shall be voltage regulated so that, at rated load and for any given setting, line voltage variations of 20 volts shall cause no more than 0.6 volt variation in output voltage.
 5. At maximum load and at 100% intensity the dimmer efficiency shall be greater than 97% and the output voltage shall have a maximum voltage drop less than 5 volts.
 6. At any rated load any intensity, the dimmers shall provide a symmetrical alternating current output to the load. When "full on" the output shall approach that of a full sine wave.
 7. Dimmers shall provide a smooth and continuous "square law" dimming curve throughout the entire dimming range as defined by IES.
 8. Dimmers shall not turn on momentarily when energized and shall not interface with other dimmers. Dimmers shall be free of overshoot, hunting or oscillation when moving from one light setting to another and shall not exhibit instability in any operation mode.
 9. All dimmers shall be completely modular in nature and interchangeable with every other module within the cabinets to allow ease of maintenance and future modification and/or expansion of the system.
 10. All dimmers shall operate satisfactorily and normally within an ambient temperature range of 0 to 40°C.
 11. All modules shall employ electronic soft start operation. The response time of the dimmer shall not exceed .25 seconds.
 12. Minimum and maximum intensity levels shall be user adjustable. Minimum intensity shall be adjustable from 0 to 50% of light output. Maximum intensity shall be adjustable from 50% to 100%. These "Trim" adjustments shall be accessible from the front of the dimmer module without removing the cover.
 13. All dimmer modules shall be completely self contained and enclosed. The modules shall incorporate the following, clearly marked LED's for status display and maintenance considerations:
 - a. Power Indication
 - b. Input Control Mimic
 - c. Dimmer Output Mimic
 - d. Control Threshold Indication
 14. Universal Dimmers:

- a. Universal dimmers shall be designed to control incandescent, low voltage incandescent and general inductive loads to allow maximum flexibility regarding modification of the system loads.
 - b. Rise time on universal dimmers shall be restricted by a suitable toroidal filter choke so that it shall exceed 400 microseconds when measured from "Turn-On" to 90% of maximum amplitude and at 90 degrees conduction angle when a full load is applied to the dimmers.
15. Non-Dim Modules:
- a. Non-dim modules shall contain solid state relays with no moving parts and shall contain two independently controlled 20 Amp non-dim circuits. The non-dim modules shall be UL listed for any loads up to the rated capacity of the module.
 - b. Non-dim modules controlling projection screens shall have interface relays and accessory control as required to provide dry-contact, momentary raise and lower signals to projection screens.
16. Additional Filtering:
- a. All dimmed circuits so designated on the electrical load schedule shall be equipped with a second toroidal filter so that at full load the current rise time shall exceed 600 microseconds when measured from 0 to 90% at 90 degrees conduction angle.
- D. Emergency Transfer Relays:
1. All circuits listed as emergency shall be fed through the emergency transfer relays.
 2. The relay system shall be so designated that upon loss of normal power to a dimming panel, the relays will automatically transfer those loads fed through the emergency transfer relay from normal dimmer panel output to a corresponding emergency power feed.
 3. Upon restoration of normal power to the dimming panel, the relays will transfer the loads back to the dimmer panel output.
 4. The relays shall be UL listed Class 508 as emergency transfer devices. Each emergency transfer panel shall be equipped with one two-pole, 20 Amp double throw relay and an integral test switch.
- E. Master Control Stations:
1. Master control station shall be programmable microprocessor based on devices. Each module shall stand alone independently of the status of other modules in the system (e.g. Distributed Intelligence). Central processor based systems shall not be acceptable. Pushbuttons shall be gas tight and rated for a minimum life of 1,000,000 operations.
 2. Each master control station shall consist of a low voltage controller and manufacturer provided backbox, which shall be shippable in advance. Rough-in box shall be UL listed and shall be the termination point of all line voltage and low voltage wiring. Controller shall connect to wiring via two plug-in connectors to facilitate installation, maintenance and future expansion or equipment upgrades. Contractor shall ensure that master controller's are properly grounded to earth ground per NEC.
 3. The master control station shall include, but not be limited to, the following control functions:

- a. Scene selection pushbuttons (5 scenes plus off).
 - b. On/Off pushbuttons.
 - c. Programmable fade rate control.
 - d. Individual channel intensity control.
 - e. Selective channel mastering intensity control.
 - f. Channel Exclusion to allow selected channels to "ignore" certain scene changes.
 - g. SET pushbutton to set scenes.
 - h. Selective or Total Learn Lock disable function to prevent unwanted scene reprogramming to of all scenes or user-selected scenes.
 - i. Non-dim channel program switch to field program a dimmer channel into a non-dim switch.
 - j. Panel Lock to prevent unwanted tampering with reset lighting levels.
4. Master control stations shall incorporate the following features:
- a. Illuminated Scene button labels glow to facilitate scene button location in a darkened room.
 - b. Control surface panel shall be covered by a hinged full rotation door.
 - c. All memory shall be retained for a minimum of 10 years in the event of power failure. This shall be accomplished without batteries.
 - d. There shall be no moving or protruding parts available to the end user once the panel is installed, with the exception of pushbuttons.
 - e. Master control station shall allow manual intensity overrides at any time. Manual overrides shall be defined as the ability to alter the intensity of any number of channels without affecting scene memory and without affecting the intensity of all channels that are not to be overridden.
 - f. All scenes and channels shall be field labeled and modified with graphics supplied by the manufacturer.
 - g. Each scene shall have a unique programmable fade rate that can vary from instantaneous to 1 hour.
 - h. Scene selection will activate the fade. A second press of the scene pushbutton will bypass the fade and activate an instantaneous scene change. All control stations shall indicate when a fade is in progress.
 - i. Stations shall be capable of jobsite configuration to the required number of channels.
5. Master controls stations shall flush mount into 4" wall construction and shall have white trim, white labels and clear pushbuttons.
6. Wiring from the master control station to the dimmer cabinet and to the remotes shall utilize low voltage class II cable installed in conduit. Connections shall be made to clearly labeled screw type terminals. A 2 pair shielded multiconductor cable shall be used for the multiplexed bus.

F. Remote Control Stations:

1. Scene remotes shall provide 5 scene pushbuttons and one OFF pushbutton and shall be flush mounted into standard single gang rough-in boxes and shall include a screwless white designer type faceplates.
2. All wiring to scene remotes shall be low voltage class II cable installed in conduit. Contractor shall ensure that scene remotes are properly grounded to earth ground per NEC.
3. All scenes shall be field labeled and modified with graphics supplied by the manufacturer.
4. Activated scenes shall have illuminated scene indication.
5. Scene remotes shall incorporate illuminated scene button indicators to facilitate scene button location in a darkened room.
6. There shall be no moving or protruding parts available to the end user once the remote is installed with the exception of pushbuttons.

2.3 LYTEmode™ System

A. General

1. LYTEmode™ dimming and non-dimming cabinets shall be listed and labeled by Underwriters Laboratories Incorporated (UL) and Canadian Underwriters Laboratories (cUL).
2. All wiring shall be low voltage and shall be able to be connected and grounded in accordance with National Electrical Code and other local regulations.
3. Data and power (24VDC) shall be supplied to stations using standard CAT5e shielded cable (Belden 1624R/1624P typical) in a daisy-chain configuration from the LYTEmode™ network.
4. Network Terminal Output Connections (Belden 1624R/1624P typical):

Pin 1:	DATA+	(white/orange)
Pin 2:	DATA-	(orange)
Pin 3:	Shield	
Pin 4:	+24 Volts DC	(white/green)
Pin 5:	Signal Ground	(green)
Pin 6:	+24 Volts DC	(white/blue)
Pin 7:	Signal Ground	(blue)
Pin 8:	+24 Volts DC	(white/brown)
Pin 9:	Signal Ground	(brown)
5. Non-volatile memory retains settings in the event of power loss.
6. LYTEmode Control Stations shall be compatible with both Lightolier® Insulated Gate Bipolar Transistor (IGBT) dimmer technology and Silicon Controlled Rectifier (SCR) dimming panels.
7. Standard white faceplate. Available in six (6) additional colors using optional LYTEmode™ color kits.
 - a. Almond
 - b. Ivory

- c. Black
 - d. Brown
 - e. Grey
 - f. Light Almond
8. Custom engraved keypads and faceplates shall be available.
9. Locking metal Security Cover shall be available as an option.
- B. LYTEmode™ Master Station**
- 1. Configuration settings shall be stored in each respective station in non-volatile memory rated for one hundred (100) years.
 - 2. Programming shall be by use of front panel buttons, without removing Master Station from wall enclosure and without the need of a computer or other electronic devices.
 - 3. Stations shall provide memory and processing for:
 - a. individual channel control, dependent on station model
 - b. 13 scenes plus Off selection
 - c. adjustable fade times
 - d. Graphic representation of relative channel intensities.
 - 4. Multiple Master Stations may be linked to control up to one hundred twenty-eight (128) independent channels.
 - 5. Channels may be programmed in a non-dim condition.
 - 6. Master Stations shall provide Raise/Lower control for each individual channel as well as master Raise/Lower for all channels.
 - 7. Fade Rate time shall be adjustable from Instant to 60 minutes, with instant override.
 - 8. Auto-Cycle feature shall sequence between five (5) or thirteen (13) scenes continuously.
 - 9. Cinema Cycle shall progress one-time thru a prearranged scene sequence.
 - 10. Alarm trigger shall send channels to a full or a flashing condition.
 - 11. Master Stations shall be configurable to allow Lock-Out for Remote Stations, Master Lock-Out/Remote Function or combinations of Lock-Out. The Master Panel or individual Presets shall feature a Lock-Out to freeze in current state.
 - 12. LED intensity of the illuminated pushbuttons shall be adjustable.
 - 13. Optional smoked tinted door shall allow display of all channel intensities.
- C. LYTEScene™ Touch Screen Stations**
- 1. The LYTEScene™ Touch Screen Master Station (ILSCLTS) shall consist of a faceplate with a color LCD Touch Screen panel. Minimum acceptable LCD dimensions are 6.4 inch TFT VGA color touch screen (640x480 resolution). The Touch Screen shall be active over the entire display. Back boxes for Touch Screen stations available from the manufacturer.
 - a. Station dimensions: 7.41 x 5.48 x 1.54 inches (18.8 x 13.9 x 3.91 cm)
 - b. Station Front Bezel: 8.03 x 6.11 inches (20.4 x 15.5 cm)
 - c. Operating Temperature: 0° to 122° F (0° to 50° C)

- d. Power: 10V to 28VDC (powered by the LYTEmode™ Network)
 - e. High Performance Backlight
 - f. Fanless operation
 2. Station provides full control of any LYTEmode™ network master or mini-master station, or partition control. Such control will allow the following parameters to be adjusted from the touch screen:
 - a. Activation of up to 13 Scenes plus “Off”
 - b. Ability to record scene and fade time
 - c. Ability to protect scenes from accidental erasure or reprogramming
 - d. Ability to exclude individual channels from a scene
 - e. Independent level control of each channel, with intensity reading from 0-100%
 - f. Set individual channels up as Dim or Non-Dim channels
 - g. Ability to assign names to Master Station, Scenes, and Channels
 - h. Ability to turn Infra-Red receiver on Master Station on or off
 - i. Ability to Lock Master Station
 - j. Activate Master Station 5-Scene or 13-Scene Auto Cycle mode
 - k. Program Alarm Trigger input to bring lights to 100% or Flash
 - l. Adjust LED intensity on the Master Station, Mini-Master Station, or Partition Control
 - m. Save Master Station settings and configuration as a file for backup or copying to additional Master Stations
3. LYTEScene™ Touch Screen shall provide visual status of all Master Stations and Partition Remotes on the network, showing real-time activation of Scenes and settings.
4. LYTEScene™ Touch Screen Master Stations shall provide an optional integral Astronomical Time Clock, allowing calendar, as well as time-of-day operation. Setup feature shall be based on either Longitude/Latitude or by City/State to provide accurate forecast of Sunrise/Sunset and compensate for Daylight Savings. Timeclock shall provide local control or building-wide control to comply with Ashrae 90.1-1999. Timeclock shall provide an Override feature to activate lights in a specific area, such override shall not exceed four hours.
5. LYTEScene™ Touch Screen shall be upgradeable without removal from the wall, using a USB Storage Device, not exceeding 64MB in size.
6. LYTEScene™ Touch Screen shall provide multiple levels of password protection, to prevent unauthorized users from adjusting lighting levels, timeclock functions, or touch screen settings.
7. LYTEScene™ Touch Screen shall have adjustable backlight level and timer, and adjustable Screen Saver settings.
8. LYTEScene™ System Touch Screen Master Station shall be available with factory programmed custom logos and backgrounds.
9. Connection to the Intelligent LYTEmode™ System network shall use standard ILS wiring schemes.

D. LYTEmode™ Station Rough-In Backboxes

1. Housing shall be wall mounted and constructed of #16 gauge CRS, with a zinc-plated Type I or Type II finish.
2. Enclosure shall be provided with internal station mounting tabs, external enclosure mounting ears, and knockouts for standard mounting and wiring methods.
3. ILS-CLB-8 Backbox for the four (4) and eight (8) channel Master Stations shall measure 7-1/4" wide by 3-7/10" tall by 3-1/2" deep.
4. ILS-CLB-16 Backbox for the twelve (12) and sixteen (16) channel Master Stations shall measure 10-3/4" wide by 3-7/10" tall by 3-1/2" deep.
5. ILS-CLB-TS Backbox for the Touch Screen Master Stations shall measure 10-3/4" wide by 3-7/10" tall by 3-1/2" deep.

E. LYTEmode™ Remote Station - 2 button

1. Each designer style station shall contain two (2) illuminated buttons for remote access to scenes from LYTEmode Master Station, which shall be stored in each respective station.
2. Station programming shall be by use of front panel buttons, without removing Station from wall enclosure and without the need of a computer or other electronic devices.
3. Stations shall provide memory and processing for:
4. Individual scene control, dependent on station model
5. Allows Master Raise/Lower control of Master Station
6. 1 scene plus Off selection
7. Infra-red receiver integrated into each station
8. LED intensity of the illuminated pushbuttons shall be adjustable.
9. Stations shall mount in a single gang wallbox or in a multi-gang box with other stations or devices.

F. LYTEmode™ Remote Station - 6 button

1. Each designer style station shall contain six (6) illuminated buttons for remote access to scenes from LYTEmode Master Station, which shall be stored in each respective station.
2. Station programming shall be by use of front panel buttons, without removing Station from wall enclosure and without the need of a computer or other electronic devices.
3. Stations shall provide memory and processing for:
4. Individual scene control, dependent on station model
5. Allows Master Raise/Lower control of Master Station
6. 5 scenes plus Off selection
7. Infra-red receiver integrated into each station
8. LED intensity of the illuminated pushbuttons shall be adjustable.
9. Stations shall mount in a single gang wallbox or in a multi-gang box with other stations or devices.

G. LYTEmode™ Remote Station - 8 button

1. Each eight (8) button designer style station shall contain a set of illuminated buttons for remote access to scenes from a LYTEmode Master Station, which shall be stored in each respective station.
 2. Station programming shall be by use of front panel buttons, without removing Station from wall enclosure and without the need of a computer or other electronic devices.
 3. Stations shall provide memory and processing for:
 4. Individual scene control.
 5. 8 scene selection
 6. Ability to be combined with six button Remote Station (ILSCL6RESW) as a single 2-gang station for 13 scenes plus Off selection.
 7. LED intensity of the illuminated pushbuttons shall be adjustable.
 8. Stations shall mount in a single gang wallbox or in a multi-gang box with other Stations.
- H. LYTEmode™ Ellipse Style Room Combine Station - ILSCL8RSPS
1. Partition control of segmented multi-room spaces shall be provided by an eight (8) illuminated button designer style Room Combine Station.
 2. The Room Combine Station shall link Multiple Master Stations so that adjustments to one Master Station are duplicated on all linked Master Stations, maintaining a uniform look throughout the expanded space. Unlinked Master Stations shall function as independent controllers for individual rooms or areas.
 3. A maximum of eight (8) partitions shall be controlled from a single Combine Station and two (2) ILSCL8RSPS stations can be linked to control up to sixteen (16) partitions.
- I. LYTEmode™ Graphic Partition Control Panel
1. Partition control of segmented multi-room spaces shall be provided by a Room Combine Graphic Panel (ILS-CL-RCGP) containing up to sixteen (16) switches.
 2. Panel faceplate shall provide engraved representation of area floor plan with LED push button switches to control linkage for each partition section.
 3. Partition status condition shall be indicated by the LED push button switches.
- J. LYTEmode™ ILSCL232 Serial Interface Port
1. The LYTEmode™ ILSCL232 Serial Interface Port shall allow integration with the LYTEmode™ Lighting Controls network, using standard RS232 communication. The ILSCL232 can operate in two modes:
 - a. LYTEmode™ ILS mode allows the ILSCL232 to send and receive system commands using the LYTEmode™ ILS protocol. In this mode, the LYTEmode™ system can communicate with a computer or handheld device operating LYTEmode™ System Software
 - b. AV mode allows the ILSCL232 can send and receive system commands using standard ASCII instructions. In this mode, building management systems or computers without the LYTEmode™ System Software can be used to communicate with the LYTEmode™ network.
 2. The ILSCL232 shall incorporate a red LED to indicate transmit activity, and a green LED to indicate receive activity.

3. LYTEmode™ ILSCL232 Serial Interface Ports shall connect to the LYTEmode network using shielded Cat5 cable. All data and power for the device shall be supplied on the network cable.
 4. The LYTEmode™ ILSCL232 Serial Interface Port shall mount in a standard single-gang box.
 5. LYTEmode™ ILSCL232 Serial Interface Ports shall be engineered and manufactured in the United States and shall be UL and cUL listed.
 6. The ILSCL232 is compatible with any Windows® based IBM® compatible computer using a standard 9-pin serial cable and RS232 communication. For computer access to the LYTEmode™ network, Desktop LYTEmode™* is recommended. For wireless access to the LYTEmode™ network, use the ILSCLWCU wireless control unit with Bluetooth® Serial Transceiver.
 7. The ILSCL232 shall utilize standard 9 pin RS232 serial cable connections of up to one hundred twenty-five (125') feet.
 8. Electrical Specifications:
 9. Input: +22 volts D.C. (powered by the LYTEmode™ network)
 10. Temperature: Storage between -25° C to + 85° C and Operating at 0° to 40° C.
 11. Standard white faceplate. Available in six (6) additional colors using optional LYTEmode™ color kits.
 - a. Almond
 - b. Ivory
 - c. Black
 - d. Brown
 - e. Grey
 - f. Light Almond
- K. LYTEmode™ System Network Wireless Control Unit
1. The LYTEmode™ Wireless Control Unit (ILSCLWCU) provides wireless access to the LYTEmode™ network, and full function control of any Master Station or Partition Control on the network.
 2. The LYTEmode™ Wireless Control Unit can be used for any Master Station to provide:
 - a. Individual channel control
 - b. 13 scenes plus "Off"
 - c. Adjustable fade times
 - d. Graphic representation of channel intensities.
 3. The LYTEmode™ Wireless Control Unit can be used for Master Station advanced setup and features:
 - a. Assigning names to individual channels or scenes,
 - b. Adjusting LED intensity of the Master Station pushbuttons
 - c. Enabling Auto-Cycle modes,

- d. Alarm modes, and
- e. Station Lockout.
- 4. The LYTEmode™ Wireless Control Unit can also be used to access a Partition Control Station (ILSCL8RSPS) for remote linking of rooms, or advanced setup. The Wireless Control Unit allows you to assign names to partition buttons for simple operation.
- 5. Integrated Bluetooth™ technology provides thirty (30') feet of wireless range, for reliable and secure connections to the Architectural Lighting Control System.
- 6. Hardware Specifications:
 - a. Brilliant 3.5" color TFT display, with high performance backlight
 - b. Bluetooth to serial socket. Simply plug into any ILSCL232 port on the LYTEmode™ network
 - c. Embedded software ensures reliable operation
 - d. Software upgradeable via USB port.
 - e. USB Cradle including battery charging slot
 - f. Leather carrying case
 - g. UL, CE, FCC
 - h. Dimensions: length 119 mm (4.7 inches) x height 16.9 mm (0.7 inches)
 - i. Weight: 167 grams (5.9 oz)
 - j. Power: 1100 mAh Lithium-Ion removable battery with rechargeable AC adapter
- L. LYTEmode™ Network Power Supply - ILSLMPS
 - 1. ILSLMPS Network Power Supply shall provide 24VDC power over the LYTEmode™ Network wiring for Master Stations, Remote Stations, and Interfaces.
 - 2. Input Power Requirements: 120VAC 50-60Hz
 - 3. Power Supply provides two (2) separate outputs rated at three (3) amperes each.
 - 4. Enclosure shall contain two (2) isolated compartments; high and low voltage, for wiring connections. Terminal blocks for all connections shall be provided.
 - 5. Multiple Power Supplies can be used to provide required capacity for very large networks, or to supply additional power for very long cable runs.
 - 6. Enclosure can be either surface or rack (4U) mounted with included dual-function mounting brackets.
 - 7. ILSLMPS Enclosure including the dual function mounting brackets shall measure 19" wide x 7" tall x 3" deep.
 - 8. LYTEmode Network Power Supply shall be capable of supplying station power requirements based on unit Station Power Requirements as provided on latest manufacture's catalog sheets.
- M. LYTEmode™ Network Power Supply - ILSLMPSC
 - 1. ILSLMPSC Network Power Supply shall provide 24VDC power over the LYTEmode™ Network wiring for Master Stations, Remote Stations, and Interfaces controlling an ILS Capio™ Plus High Density Dimmer Rack system.

2. Input Power Requirements: provided by Capio™ Plus Dimmer Rack
3. Power Supply provides a single network output rated at 1.25 amperes (30 watts).
4. ILSMPSC shall be hot-swappable for field replacement without removing power to the dimmer rack.
5. Terminal blocks for all connections shall be provided.
6. Power Supply Module mounts in a slide-in compartment below the Capio™ Plus Rack Control Module.
7. ILSLMPSC Slide-In Enclosure shall measure 12.3125" wide x 1.5" tall x 6.125" deep.
8. LYTEmode™ Network Power Supply shall be capable of supplying station power requirements based on unit Station Power Requirements as provided on latest manufacture's catalog sheets.

N. LYTEmode™ Dimming Cabinets

1. LYTEmode™ Dimmer Cabinets shall be wall mounted N.E.M.A. grade, constructed of not less than U.S. #14 gauge sheet steel welded into a rigid structural back. Cabinet shall be shippable in advance, without dimming modules, to allow for immediate installation.
 - a. Cabinet shall be recessable into a normal 4" wall.
 - b. Cabinet shall be surface mounted and shall not extend more than 4.5" from the wall. Floor mounted cabinets are not acceptable.
2. All equipment to be contained in the cabinet shall be provided with all internal wiring completed by the manufacturer, tested for proper operation, and arranged in a neat, orderly manner.
 - a. Cabinet and dimming modules shall be provided separately to facilitate the installation of the cabinet.
 - b. Dimmer control wiring shall be terminated by plug-in connections to facilitate installation, maintenance and repair operations.
 - c. Cabinet shall employ dimmer-to-channel assignment matrices so that dimmers may be assigned to any channel without removing the cabinet cover. Hard-wired dimmer-to-channel connections shall not be acceptable.
3. Cabinet shall be constructed as one unit with all necessary support and clearances for all devices required for a complete system. Main feed and line voltage wiring may enter the cabinet from top or side of the cabinet.
4. Cabinet shall be cooled exclusively by means of free convection, unaided by fans, and shall operate in an ambient temperature range of 0 to 40 C (32 to 105 F). Cabinets that require fans for ventilation shall not be acceptable.
5. Cabinet shall contain input circuit breakers to provide protection for each dimming or non-dim module. Circuit breakers shall be designed to trip within 8 milliseconds after a 400 ampere surge. Circuit breakers shall contain a visual trip indicator and shall be rated at 10,000 AIC.

O. LYTEmode™ Dimming Modules

1. LYTEmode™ Dimmer Modules shall be based on the use of Silicon Controlled Rectifiers (SCR) to control the power furnished to the loads. The complete load current shall be carried by these devices. They shall be capable of withstanding surges, without impairment to performance, of 6000 volts, 3000 amps as specified by IEEE Standard 587-1980. In addition, under fully loaded operating conditions, all devices shall operate at a minimum twenty (20°) degrees Celsius safety margin below the component temperature rating.
2. Dimmer Modules shall be designed for a supply line voltage of 120 volts AC, 60 Hz. and shall regulate output voltage such that at rated load and for any given control setting, line voltage variations of twenty (20) volts shall cause no more than 0.6 volt variation in output voltage.
3. At maximum load and at 100% intensity the dimmer efficiency shall be greater than 97% and the output voltage shall have a maximum voltage drop of less than five (5) volts.
4. Dimmers shall respond to a low voltage, DC control signal of 0 to 10 volts. Performance shall not vary by more than two (2%) percent from dimmer to dimmer using a common control signal. Dimmers shall operate without phase sensitivity with respect to the control signal or upon which phase the dimmer operates. The control circuit shall be completely isolated from the power circuit.
5. At any rated load and any intensity, the dimmers shall provide a symmetrical alternating current output to the load. When full on, the output shall approach that of a full sine wave.
6. Dimmers shall provide a smooth and continuous "square law" dimming curve throughout the entire dimming range as defined by the Illuminating Engineering Society.
7. Dimmers shall not turn on momentarily or "flash" when energized and shall not interact with other dimmers. Dimmers shall be free of overshoot, hunting, or oscillation when moving from one light setting to another and shall not exhibit instability in any operation mode.
8. All dimmers shall be completely modular in nature and interchangeable with every other module within the cabinets to allow ease of maintenance and future modification or expansion of the system. All dimmer modules shall be self contained and enclosed. A power indication LED shall be incorporated for status display and maintenance operations.
9. All modules shall employ electronic soft start operation. The response time of the dimmer shall not exceed .25 seconds.
10. Maximum output intensity levels shall be user adjustable from 100% down to 50%. These trim adjustments shall be accessible from the front of the dimmer without removing the cover.
11. Universal Dimming Modules shall be designed to control incandescent, magnetic low voltage incandescent, neon, electronic low voltage, cold cathode, or general inductive loads to allow maximum flexibility regarding modification of the system loads. Rise time shall be restricted by a suitable toroidal filter so that it shall exceed 400 microseconds when measured from turn-on to 90% of maximum amplitude and at 90 degrees conduction angle when a full load is applied to the dimmers.

12. Non-Dim Modules shall contain solid state relays with no moving parts. Non-Dim modules utilizing electro-mechanical relays shall not be acceptable.
13. Fluorescent Modules shall be used in conjunction with electronic dimming ballast, listed as suitable by Lightolier Controls for use with this module.

2.4 High Density Dimmer Rack - Capio™ Plus

A. General

1. Capio™ Plus Dimmer Rack shall be a high-density dimmer rack system based on Insulated Gate Bipolar Transistor (IGBT) dimmer technology.
2. Capio™ Plus Dimmer Rack and its contents shall be listed and labeled by Underwriters Laboratories Incorporated (UL).

B. Mechanical

1. Capio™ Plus Dimmer Rack shall be a dead front switchboard, substantially framed and enclosed with 16 gauge cold-rolled steel panels. All rack components shall be properly treated, primed, and finished. Exterior surfaces shall be finished in fine-textured, scratch-resistant powder coat paint. Interior surfaces shall have a corrosion-resistant finish.
2. Capio™ Plus shall be available in 24 and 48-module configurations. Racks shall not exceed the following dimensions:
3. Rack - 24 Module: 46" x 14.25" x 25.75" (116.84 x 36.20 x 65.41 cm)
4. Rack - 48 Module: 82" x 14.25" x 25.75" (208.28 x 36.20 x 65.41 cm)
5. Capio™ Plus shall be available in 24 and 48-module configurations. Racks shall not exceed the following weights:
6. Rack - 24 Module: 135 pounds (59.8 kg) empty
7. Rack - 48 Module: 215 pounds (90.7 kg) empty
8. Each rack shall have a lockable door containing a removable and user cleanable air filter. A fan assembly shall be located near the top of the rack to draw air through the filter, over the modules, and out the top. The fan assembly shall maintain proper operating temperature for all components provided the ambient temperature of the room does not exceed one hundred four (104°) degrees Fahrenheit (40°C).
9. Racks shall be designed for front access to allow adjacent or back-to-back mounting. Busing kits shall be available to allow adjacent racks of the same size to use a single line feed.
10. Racks shall be designed to allow easy insertion and removal of modules without the use of tools.

C. Electrical

1. Capio™ Plus shall operate at 120/208 VAC 3 phase, 4 wire + ground rated:
2. ILSCP48 – 800 amps maximum.
3. ILSCP24 – 400 amps maximum.
4. Racks shall be completely internally pre-wired by the manufacturer. The installer shall provide and mount input feed, load wiring, control wiring, and optional Capio™ Plus Bus Kits as required.

5. Load terminals shall accept up to #4 AWG wire, or two #8 AWG wires.
6. Feed terminals shall accept up to two (2) 600kcmil wires per phase.
7. Ground lug terminals shall accept up to #2/0 AWG wire.

D. Rack Electronics

1. Rack control electronics shall be housed in one (1) plug-in Rack Control Module (CPRCM).
2. The dimmer rack standard control signal is Lightolier Controls LYTEmode ILS Architectural Lighting Control Protocol, or USITT DMX512, or optional Pathport DMX management via Ethernet. This incoming signal terminates in the Rack Control Module (CPRCM) via CAT5e terminals and modular jumper cable. The protocol transmits 512/1024 discrete levels to the rack. The rack in return transmits dimmer status data from its full complement of dimmers to the controller.
3. Each Rack Control Module (CPRCM) shall include one (1) permanently mounted RJ-45 jack to which the contractor shall land the incoming Ethernet control cable. Standard Category 5e jumper shall be used to distribute control signals to the rack.
4. The Rack Control Module (CPRCM) monitors the thermal operating conditions in the rack and turns the rack fan cooling assembly on as required.
5. The Rack Control Module (CPRCM) shall accept two optically isolated USITT DMX512/1990 protocol inputs on two (2) permanently mounted 5-pole screw terminal blocks located on the upper backplane PCB. Loop through connections shall also be provided.
6. The Rack Control Module (CPRCM) shall also have two (2) closure terminals that may be programmed to initiate external operations by other equipment. These terminals shall be accessible as screw terminals in the rack control-wiring compartment.
7. Rack configuration shall be performed by a PC-based program.
8. Replacing a dimmer module shall not require reprogramming of the system or processor.

E. Equipment List (quantities as shown in schedules, tables, and drawings):

1. ILSCP24 Capiro™ Plus Dimmer Rack (24 module spaces)
2. ILSCP48 Capiro™ Plus Dimmer Rack (48 module spaces)
3. CPRCM Capiro™ Plus Rack Control Module
4. CPSPARES Spare Parts Kit (fuses, hardware & manuals)
5. CPPAD48 Vibration Dampening Pads (48 space rack)
6. CPQFK48 Quiet Squirrel-Cage Fan Kit (48 space rack)
7. CPBUS48 Rack Busing Kit (48 space rack)
8. CPFM Acoustic Fan Muffler
9. CPPAD24 Vibration Dampening Pads (24 space rack)
10. CPQFK24 Quiet Squirrel-Cage Fan Kit (24 space rack)
11. CPBUS24 Rack Busing Kit (24 space rack)

2.5 Dimmer Modules - Capiro™ Plus

A. General

1. Dimmer Modules shall use IGBT (Insulated Gate Bipolar Transistor) to regulate and control load voltage. Dimmers using hard-switching semiconductor devices, such as SCR's or other thyristors shall not be acceptable.
2. The dimmers shall not use filter chokes to control the rate of transition in the load current waveform.

B. Mechanical

1. Modules shall be plug-in and factory wired. Each module shall be labeled with manufacturer's name, catalog number, and rating. Each module shall contain a mechanical interlock to prevent insertion or removal with its circuit breakers in the "on" position.
2. Standard factory modules shall be available to provide Non-Dim circuits and Constant circuits.

C. Electrical

1. Dimmer modules shall be available in dual or single configurations for two 20A loads, one 50A load, or one 20A HDF load.
2. Each dimmer module will contain one or two circuit breakers having an AIC rating of 10,000.
3. Dimmer electronics shall be completely solid state modules using magnetic chokes shall not be acceptable.
4. The dimmers shall be immune from damage caused by output short-circuits between load and neutral or load and ground.

D. Performance

1. Voltage drop across the complete dimmer at full load current while producing a full output sine wave (insertion loss) shall be three (3V) volts RMS or less. Insertion loss at reduced dimmer loading shall not vary significantly from that produced with a full rated load. Dimmers with insertion loss greater than three (3V) volts RMS at full rated load shall not be acceptable.
2. Dimmer Modules shall provide compatible dimming control of the following load types:
 - a. Incandescent / Quartz Halogen
 - b. Cold cathode / Neon
 - c. Electronic low-voltage
 - d. Magnetic low-voltage
 - e. Fluorescent 3-wire ballasts (PowerSpec HDF)
 - f. Fluorescent 2-wire ballasts (Advance® Mark 10)
3. Dimming system shall meet or exceed FCC "Class A" standards for RFI/EMI emissions.
4. The dimmers shall use "Digital Power Envelope Processing" to regulate dimmer output to within plus or minus 0.5 volts RMS of the assigned setting. Regulating response shall occur in the same power line cycle as the disturbance when the dimmer is in Reverse Phase Control (RPC) mode.

5. Zero cross detection to synchronize dimmer to the power line frequency is not acceptable. Dimmer output voltage shall be unaffected by severely distorted or noisy power line waveforms.
6. The dimmers shall return status information (Talkback™) to the Rack Control Module (CPRCM). Status information shall also be exported by the Capiro™ Plus Dimmer Rack to a management system using Lightolier Controls' Guardian Software. The following information shall be reported:
 - a. Present power line voltage
 - b. Connected lamp wattage
 - c. Present output setting
 - d. Dimmer operating temperature
 - e. Dimming mode
 - f. Overload condition
 - g. No load condition
 - h. Focus mode
7. Dimmers shall hold last received level for a user definable pre-specified period, should the control signal be interrupted.
8. The Dimmer Modules shall reduce the level of lamp filament noise, when load type and other conditions permit. Noise Reduction shall be accomplished by use of Reverse Phase Control (RPC), during which the dimmer is on from the beginning of the half-cycle until the desired output voltage is reached. In Forward Phase Control (FPC) mode, the dimmer turns on within the half-cycle and stays on until the end of the half-cycle.
9. Dimmer Modules shall automatically switch from Reverse Phase Control (RPC) mode to Forward Phase Control (FPC) mode when inductive loads are detected.
10. LOW HARM™ mode shall reduce harmonic currents present on the feed neutral conductor by automatically switching the dimmers in the system to an optimum configuration of FPC and RPC operation. The reduction in neutral current shall be a minimum of 33% with a maximum of 100%, depending upon load sizes and their associated levels.
11. Dimmers shall provide a nominal transition time of 800 μ S under normal load current regardless of load. When in RPC mode, dimmer output voltage transition time is measured as "fall time". The actual "fall time" generated shall not be affected by the size of the load present.
12. The dimmer transfer function shall comply with the industry standard Square Law dimming curve within a tolerance of plus or minus 0.5 Volts RMS for all incandescent loads.
13. Dimmer modules shall provide an associated Focus push button that provides local ON/OFF/LEVEL control for focusing, maintenance, and other purposes. If the level set for a dimmer is zero, tapping the Focus button shall set the dimmer output to full. Pressing and holding the Focus button ramps the dimmer output up to any intermediate level. When a non-zero level is received from the controller, the dimmer shall return to normal operation. Tapping the Focus button, a second time shall also return the dimmer

to normal operation. If a dimmer already has a non-zero level from the control desk, the Focus button flashes the dimmer to full output. In all cases, activating the Focus button shall be reported to the system operator, at the Horizon Console or system monitor.

14. Each dimmer shall have an LED display to facilitate local reporting of operating conditions.
15. Each dimmer will detect operating conditions and take active preventive measures to protect itself and associated load, which shall include, but are not limited to the following:
 - a. At power-up, each dimmer will detect line voltages in excess of 180 VAC. When over-voltage is detected, the dimmer will not turn on its load. The dimmer will also notify the operator via Talkback™ and flash its locally mounted LED's. Dimmers shall withstand line voltages up to 230 VAC for an indefinite period and up to 280 VAC for fifteen (15) minutes with no damage.
 - b. Each dimmer shall detect excessive heat sink operating temperatures and provide notification of such condition via Talkback™. The dimmer shall automatically reduce its own "fall time", which minimizes the production of heat. Dimmers will step from 800µS to 250µS. If heat continues to rise, the dimmer will shut down, notify the Horizon Console via Talkback™, and flash its locally mounted LED's. If more than six (6) dimmer modules shut down, the entire rack will shut down as a protective measure.
 - c. Each dimmer shall detect load current in excess of its own rating. An overload will cause a dimmer to shut down, provide notification of such condition via Talkback™, and flash its locally mounted LED's.

E. Equipment List (quantities as shown in schedules, tables, and drawings):

- | | | |
|----|---------|--|
| 1. | CP20HP | Capio™ Plus Dual 20A Dimmer Module (800 µs) |
| 2. | CP20ND | Capio™ Plus Dual 20A Non-dim Module |
| 3. | CP20CC | Capio™ Plus Dual 20A Constant Circuit Module |
| 4. | CP15HP | Capio™ Plus Dual 15A Dimmer Module (800 µs) |
| 5. | CP15ND | Capio™ Plus Dual 15A Non-dim Module |
| 6. | CP15CC | Capio™ Plus Dual 15A Constant Circuit Module |
| 7. | CP50 | Capio™ Plus Single 50A Dimmer Module (800 µs - max. 10 / rack) |
| 8. | CP20HDF | PowerSpec HDF Fluorescent Dimming Module |
| 9. | CPBLANK | Blank Module for empty rack spaces (req. for air flow control) |

2.6 VISTA ARCHITECTURAL CONTROL SYSTEM

A. General Description

1. The Architectural Control System shall consist of one (1) Vista Electronics Module, one (1) Vista Touch Screen Master Control Station, and any combination of Vista Touch Screen Room Stations or Button Stations.
2. Control stations shall be constructed using Lexan™ overlays inside the Decora® frame. Button Station legends shall be engraved on the back of the overlay, providing a smooth,

easily cleaned surface. Owner may specify legend text and graphics. Overlays and engraving shall be available in custom colors.

3. The link between the Vista Electronics Module and the control stations shall be topology-free wiring. Daisy chain, spoke and hub, and/or home run wiring may be used in any combination. All Button Stations shall be linked by four conductors (two twisted pairs) that distribute both data and power. Runs of over 50 feet require shielding. Maximum total cable length: 2800 feet. Belden 8102 or equivalent recommended. Touch Screen Stations require two (2) additional #14 AWG wires if located at a distance greater than twenty (20) feet away from the Vista Electronics Module.
4. The link between the control electronics and the dimmers shall be the industry standard USITT DMX512/1990 protocol, which shall require five (5) conductors (two twisted pairs plus shield). Belden 8132 or equivalent recommended. Cable meeting EIA-485 specifications is required.

B. Product Features

1. The Vista Architectural System shall provide but is not limited to the following features:
 - a. 512 dimmers per system
 - b. 12 rooms per system
 - c. 40 zones (channels) per room (max. 480 per system)
 - d. 16 presets per room (max. 192 per system)
 - e. 16 stations per room (max. 127 per system)
 - f. 16 partitions (to join and separate rooms) per system
 - g. 16 work light zones per system
 - h. 16 work light stations per system
2. Initial system configuration shall require a Vista Touch Screen Master Station and a Vista Electronics Module.
3. All system configuration information shall be stored in non-volatile memory.

C. Vista Electronics Module (IPS-VM-512)

1. The Vista Electronics Module (IPS-VM-512) shall be a 19-inch rack-mounted enclosure that includes all electronics necessary to support the control station network and DMX512 processing. A tilt-out wall mounted enclosure (IPS-VM-512-WB) may be added for wall mount applications. Module dimension are as follows:
 - a. Rack Mount: 19 inches x 3.5 inches (2U) x 7.5 inches (48.26 x 8.89 x 19.05 cm)
 - b. Wall Mount: 24.5 inches x 23.125 inches x 4 inches (62.23 x 58.738 x 10.16 cm) (11.25 in/28.58 cm depth in tilt-out mode)
2. The Vista Electronics Module shall be compatible with external DMX512 control devices. The operation of the Vista controls and theatrical control systems (if present) shall be independent of one another. The highest DMX512 control level present from either system shall take precedence.

2. The Vista Electronics Module shall detect and automatically forward Intelligent Remote Configuration Protocol (IRCP) packets originating on an attached theatrical system (if present).
 3. The Vista Electronics Module shall detect and automatically forward Talkback™ data returned by Intelligent Power System® (IPS) dimmers. It shall also capture and analyze this data to detect burned out lamps.
- D. Vista Touch Screen Master Station (IPS-VT-MASTER)
1. The Vista Touch Screen Master Station (IPS-VT-MASTER) shall consist of a faceplate with a color LCD Touch Screen panel. Minimum acceptable LCD dimensions are 3.9 inches wide by 2.9 inches high (9.91 x 7.37 cm). Minimum acceptable LCD resolution is 320 pixels by 240 pixels. The Touch Screen shall be active over the entire display. Back boxes for Touch Screen stations provided by the manufacturer. A 19-inch rack mount kit is also available.
 2. Station dimensions: 5.0 x 8.4 x 2.5 inches (12.70 x 21.34 x 6.35 cm)
 3. The Vista Touch Screen Master Station (IPS-VT-MASTER) shall provide access to system setup pages. Each Master Station shall have seven physical (“hard”) buttons outside the display area. These buttons handle page navigation.
 4. “View Presets” takes you to the Presets Page. This page shall contain up to eight Preset Recall buttons, a “Learn” button, Fade Time Raise and Lower buttons, and a “Select Preset Names” button. These buttons perform as follows:
 - a. The eight Preset Recall buttons are used to play back stored preset lighting levels, or, if the Learn function is active, to record preset levels.
 - b. The “Learn” button activates the Learn function. Complete the Learn action by pressing one of the eight Preset Recall buttons. The current lighting levels and the fade time value showing in the Time display will be learned to that preset.
 - c. Time display has a pair of raise and lower buttons to change the value of the fade time that will be learned into a preset. Fade times may be from one second to 54 minutes.
 5. “Select Preset Names” takes you to the Select Preset Names Page. This page allows the user to select names from the Name List for each preset in each room. The actual names in the name list may be edited with one of the System Configuration functions. Also on this page is a control for locking individual presets. A locked preset cannot be modified by the Learn function.
 6. “View Zones” takes you to the Zones Page. This page contains up to eight raise/lower buttons for lighting control zones. The current lighting level for the zone is reported in the level display between the two buttons. The level display is also an active button that may be used to set a zone to a special “ignore” level. This level is used for creating zone-selective presets.
 7. “View Menu” takes you to the System Menu Page. This page contains five buttons, which perform as follows:
 - a. “Join Rooms” takes you to the Joined Rooms Page. This page contains up to eight buttons. Each numbered “join” button toggles the state of one moveable partition. The affected rooms are shown in the table next to the buttons. When a button is

- highlighted, the two rooms adjacent to the partition are joined and their zones and presets will operate together.
- b. "Work Lights" takes you to the Work Light Controls Page. This page contains up to eight on/off button pairs to control work light zones. The current state of each zone is shown in the display between the pairs.
 - c. "Lockouts" takes you to the Station Lockout Page. This page contains up to twelve buttons. Each button activates the Station Lockout function for one room. The button lights up to indicate that the function is active. When "Station Lockout" is active for a room, the push-button preset recall stations that have been designated as "Lockable" are not able to control the lighting levels. Pressing the "Lock" button a second time re-enables these preset recall stations.
 - d. "Dimmer Status" takes you to the Dimmer Status Page. This page allows the user to analyze the current dimmer loading to determine if lamps have burned out or have been changed to inappropriate load sizes.
8. "Configure" takes you to the System Configuration Page. You must enter a pass code to view the System Configuration page. The System Configuration Page allows the user to edit the following:
- a. Venue Data
 - b. Room Data
 - c. Station Data
 - d. Zone Data
 - e. Partition Data
 - f. Work Light Station Data
 - g. Dimmer to Zone Patch
 - h. Name List
 - i. Dimmer Profiles
 - j. Fade Engine Properties
 - k. Station attributes including LCD time out, brightness, and contrast.
9. "View Panic" takes you to the Engage Panic Page. This page contains twelve buttons for setting or clearing the panic state in each room. These buttons are highlighted when the panic state is active. This page also contains buttons to globally set or clear the panic state in all rooms.
10. "More" shows you more information for any given page if more is present (additional zones, presets, partitions, etc.).
11. "Next Room" and "Previous Room" show you the zones or presets for other rooms defined in the system.
- E. Vista Touch Screen Room Station (IPS-VT-ROOM)
1. The standard Vista Touch Screen Room Station (IPS-VT-ROOM) shall consist of a faceplate with a color LCD Touch Screen panel. Minimum acceptable LCD dimensions are 3.9 inches wide by 2.9 inches high (9.91 x 7.37 cm). Minimum acceptable LCD resolution is 320 pixels by 240 pixels. The Touch Screen shall be active over the entire

display. Back boxes for Touch Screen stations provided by the manufacturer. A 19-inch rack mount kit is also available.

2. Station dimensions: 4.5 x 8.2 x 2.5 inches (11.43 x 20.83 x 6.35 cm)
3. The Vista Touch Screen Room Station (IPS-VT-ROOM) shall allow the user to select or record presets, adjust zone levels, activate panic, and lockout stations in a particular room. Each Room Station shall have four physical "hard" buttons outside the display area. These buttons handle page navigation.
4. "View Presets" takes you to the Presets Page as described for Vista Master Station.
5. "View Zones" takes you to the Zone Raise/Lower Page as described for Vista Master Station.
6. "View Menu" takes you to the System Menu Page. This page contains three buttons that perform as follows:
 - a. "Lights on Panic" sets or clears the panic state for the room. The button is highlighted when the panic state is active.
 - b. "Lockout Stations" sets or clears the lockout state for the room. The button is highlighted when the lockout state is active.
 - c. "Panel Setup" takes the user to a page that allows adjustment of station attributes including LCD time out, brightness, and contrast.
 - d. "More" shows you more zones or more presets on the current page if more are defined.

F. Button Control Stations

1. The standard Vista Button Station (IPS-VB Series) shall be a Decora®-style device with screwless faceplate, available in white or black. Button Stations are available in three sizes. One-gang stations may contain up to eight buttons or one keyswitch. Two gang stations may contain up to 16 buttons. Three gang stations may contain up to 32 buttons. Each button may have an LED indicator. Dimensions of each station are as follows:
 - a. One gang: 4.7 x 2.9 x 1.7 inches (11.94 x 7.37 x 4.32 cm)
 - b. Two gang: 4.7 x 4.8 x 1.7 inches (11.94 x 12.19 x 4.32 cm)
 - c. Three gang: 4.7 x 6.6 x 1.7 inches (11.94 x 16.76 x 4.32 cm)
2. Button Control Stations shall function as Preset Recall, Work Light, Panic, or Raise/Lower Stations. Some stations may combine Raise/Lower and Preset Recall functions, and/or execute Learn functions.
 - a. On standard Preset Recall Stations, pressing any of the preset buttons will activate that preset in the time recorded for that preset. The LED associated with the selected preset button will illuminate to indicate that the preset is active. If the "Station Lockout" function has been activated from the master station, then the Preset Recall Stations that have been programmed as lockable will not be able to control the lighting levels. Each station operates only the lights in the room to which it has been assigned.

- b. Work Light Stations are available with either separate on and off buttons or a single toggle button for each work light zone. Each control has an LED indicator that illuminates when the work light zone is On.
- c. Standard Panic Stations have 2 buttons. "Panic On" activates the panic state for the room. "Panic Off" deactivates the panic state for the room.
- d. Standard Lockout Stations have two buttons. "Lockout On" activates the lock state for the room. "Lockout Off" deactivates the lockout state for the room.
- e. Raise/Lower Stations shall have from 1 to 16 pairs of buttons, for raise/lower control of 1 to 16 zones.
- f. Standard stations may combine Raise/Lower and Preset Recall functions, and/or execute Learn functions.

G. Keyswitch Stations

- 1. Keyswitch Stations are available with the same functionality as Preset Recall, Panic, and Lockout Stations. Keyswitch Stations.
- 2. Shall be constructed on a Decora®-style plate and shall include a double-throw, center-off spring return keyswitch along with a single LED indicator.
- 3. Operation shall as described for Button Control Stations.

H. Contact Closure Station

- 1. A sixteen input contact closure interface is available to allow interface to Audio-Visual or building controls systems.
- 2. The sixteen-input Contact Closure Station shall substitute for any button station having no more than 16 buttons. This station includes sixteen outputs suitable for driving LED indicators. All inputs are momentary contacts, and operation of the station shall be identical to the station it replaces.

I. Equipment List (quantities as shown in schedules, tables, and drawings):

- 1. IPS-VM-512 Vista Electronics Module, Rack mount
- 2. IPS-VM-512-WB Vista Electronics Module, in Wall mount enclosure
- 3. IPS-VT-MASTERX Vista Touch Screen Master Station
- 4. IPS-VT-ROOMX Vista Touch Screen Room Station
- 5. IPS-VB-168 Vista Button Station - 3 gang, 32 buttons
- 6. IPS-VB-160L Vista Button Station - 3 gang, 19 buttons
- 7. IPS-VB-160 Vista Button Station - 2 gang, 16 buttons
- 8. IPS-VB-812 Vista Button Station - 3 gang, 32 buttons
- 9. IPS-VB-88L Vista Button Station - 3 gang, 27 buttons
- 10. IPS-VB-86W Vista Button Station - 3 gang, 20 buttons
- 11. IPS-VB-84 Vista Button Station - 2 gang, 16 buttons
- 12. IPS-VB-80L Vista Button Station - 2 gang, 11 buttons
- 13. IPS-VB-80W Vista Button Station - 2 gang, 8 buttons
- 14. IPS-VB-80 Vista Button Station - 1 gang, 8 buttons

15.	IPS-VB-60W	Vista Button Station - 2 gang, 6 buttons
16.	IPS-VB-60	Vista Button Station - 1 gang, 6 buttons
17.	IPS-VB-30W	Vista Button Station - 2 gang, 3 buttons
18.	IPS-VB-30	Vista Button Station - 1 gang, 3 buttons
19.	IPS-VB-20W	Vista Button Station - 2 gang, 2 buttons
20.	IPS-VB-20	Vista Button Station - 1 gang, 2 buttons
21.	IPS-VB-016	Vista Button Station - 3 gang, 32 buttons
22.	IPS-VB-08W	Vista Button Station - 3 gang, 16 buttons
23.	IPS-VB-08	Vista Button Station - 2 gang, 16 buttons
24.	IPS-VB-04W	Vista Button Station - 2 gang, 8 buttons
25.	IPS-VB-04	Vista Button Station - 1 gang, 8 buttons
26.	IPS-VB-LockW	Vista Button Station - 2 gang, 2 buttons
27.	IPS-VB-Lock	Vista Button Station - 1 gang, 2 buttons
28.	IPS-VB-PanicW	Vista Button Station - 2 gang, 2 buttons
29.	IPS-VB-Panic	Vista Button Station - 1 gang, 2 buttons
30.	IPS-VK-20	Vista Button Station - 1 gang, 1 keyswitch
31.	IPS-VK-LOCK	Vista Button Station - 1 gang, 1 keyswitch
32.	IPS-VK-PANIC	Vista Button Station - 1 gang, 1 keyswitch
33.	IPS-VB-JOIN	Vista Button Station - 2 gang, 16 buttons
34.	IPS-VC-16	Contact Closure Input

2.7 MultiSet Pro Lighting Control System

A. Multiset Pro Dimmer

1. Preset dimmer shall be designer style device and shall gang with any designer style device.
2. Preset dimming control shall be able to operate at rated load capacity with out adversely effecting expected design life.
3. Keypad shall be line voltage (120VAC) with Hot, Neutral, and Ground.
4. "Strap" models (MSP) shall fit in standard single gang contractor box (3.5 inch deep) with out the need to be derated when ganging with other Multiset Pro devices or other designer style devices.
5. "Heatsink" models (MHP) shall fit in standard single gang contractor box (3.5 inch deep) when mounted alone.
6. MHP models shall be able to be mounted with other MHP devices without the need to be derated. MHP models shall be mounted in "no fins broken" or "fins broken" configurations only. MHP models shall be compatible with Lightolier Controls Multi-gang "NFB or FB" faceplates or can be mounted in standard 4"x 4" wireway for ease of installation using faceplates provided.
7. MSP model shall be available in minimum 600-watt universal load rated devices. Load to be controlled shall be incandescent, low voltage magnetic incandescent, neon/cold

cathode, fluorescent, fan, Lightolier Controls "DA" series amplifiers, and general inductive loads.

8. MSP model shall be available in 300-watt electronic low voltage incandescent. Device shall match universal dimmer in fit and appearance.
9. MSP model shall be available in a 600HDF direct drive for operation with Lightolier Controls PowerSpec HDF fluorescent Dimming Ballasts or "DA" series amplifiers (120-volt applications). Device shall match universal dimmer in fit and appearance.
10. MHP model shall be available in 600-watt, 1000-watt, 1500-watt, and 2000-watt universal load rated devices.
11. Loads to be controlled shall be incandescent, low voltage magnetic incandescent, neon/cold cathode, fluorescent, fan, and general inductive loads.
12. MHP model shall be available in 500-watt electronic low voltage incandescent. Device shall match MHP 600 and 1000 watt universal dimmer in fit and appearance.
13. MHP model shall be available in 600 or 1500HDF direct drive for operation with Lightolier Controls PowerSpec HDF fluorescent Dimming Ballasts or "DA" series amplifiers (120VAC applications). Device shall match 600VA and 1500VA universal dimmers in fit and appearance.
14. All dimmers shall communicate on a single line voltage wire interconnected between all electronic MHP devices, optional MHP interface devices, and preset keypads completely independent of phase.
15. This interconnect will occur within each unique control system consisting of up to thirty (30) devices.

B. Multiset Pro Switch (ND)

1. Non-Dim (ND) strap style switch shall be designer style device and shall gang with any designer style device.
2. ND switch shall be able to operate at rated load capacity with out adversely effecting expected design life.
3. "Strap" model (MSP) shall fit standard single gang contractor box (3.5 inch deep) with out the need to be derated when ganging with other Multiset Pro devices or other designer style devices.
4. "Heatsink" model (MHP) shall fit in standard single gang contractor box (3.5 inch deep) when mounted alone.
5. MHP model shall be able to be mounted with other MHP devices without the need to be derated. MHP model shall be mounted in no fins broken configurations only. MHP models shall be compatible with Lightolier Controls Multi-gang "NFB" or "FB" faceplates or can be mounted in standard 4"x 4" wireway for ease of installation using faceplates provided.
6. MSP models shall be available in 600-watt universal load rated devices. Load to be controlled shall be any general resistive or inductive non-dim type load.
7. MHP models shall be available in 1000-watt and 2000-watt universal load rated devices only. Load to be controlled shall be any general resistive or inductive non-dim type load.

8. All electronic switches must operate on a single line voltage communication wire interconnected between all dimmers, optional interface devices, and preset keypads completely independent of phase. This interconnect shall occur within each unique control system consisting of up to thirty (30) devices.

C. Multiset Pro Dimmer/Switch Features

1. All models shall be capable of “learning” thirteen (13) preset levels and recalling those presets with a touch of a button. Preset levels shall be set (learned) by using a non-extrusive set button located on each control device.
2. Preset level shall not be learned until the set button is pressed. This feature shall allow manual setting, which will not affect preset levels (manual override).
3. All models will return to previous level after power failure.
4. Dimming models shall allow fade rates between presets to be selected in twelve steps from 1.5 sec to 60 min.
5. Dimming models shall fade to preset level with a single press of a button or by-pass Fade Rate and quickly move to these levels with a double press.
6. All models shall incorporate a red LED indicator to display current output level. Preset level shall be indicated by a single soft glow LED.
7. All models shall have a built in LED at the top of the trim ring for locating the device while in an Off state.
8. All models shall incorporate a positive air gap switch accessible without removal of faceplate.

D. Sources

1. Dimmers shall be able to control the following sources (load types) with a smooth continuous Square Law-dimming curve:
 - a. Incandescent,
 - b. Low Voltage Magnetic Transformers
 - c. Neon/Cold Cathode.
2. Dimmer shall contain circuitry to provide symmetrical waveforms to prevent DC offset voltage from being delivered to the load being controlled.
3. Dimmers shall be compatible with diode type lamps.
4. Dimmers shall be input voltage compensated to eliminate output sag during momentary input voltage fluctuations.
5. Dimmers shall contain “soft start” circuitry to minimize turn on in-rush current.
6. DA amplifiers shall be available for channels/zones requiring multiple circuits dimmed together or larger loads. DA amplifiers shall be compatible with Lightolier Controls HDF load rated dimmers.
7. Electronic Low Voltage Transformers
 - a. Dimmers shall provide flicker free performance with no interaction between dimmed circuits.
 - b. For larger load applications, a “DA” amplifier shall be available. Amplifier shall be compatible with Multiset Pro (HDF) dimmers.

8. Electronic Fluorescent Dimming Ballasts (GLT/HDF/EB)
 - a. Dimmers shall be compatible with Lightolier Controls GLT/HDF dimming ballasts and Advance Mark 10 dimming ballast (EB).
 9. Controllable dimming ballasts-Lightolier Controls GLT/HDF T4, T5, T8, and PLT series ballasts.
 10. Ballasts shall be available in universal 120/277 volt AC up to four (4) lamp models (specific to lamp type).
 11. Ballasts shall be designed such that 3' and 4' linear T8 models can be mixed on the same dimmed circuit and maintain consistent light output at any output level.
 12. Ballasts should be capable of striking lamps at any light level.
 13. Ballasts shall comply with an "A" sound rating.
 14. Ballasts output level should be flicker free though out the entire dimming range.
 - a. Direct drive dimmers shall be available for 120 volt AC applications.
 - b. DA amplifiers shall be available for channels/zones requiring multiple circuits to be dimmed together or circuits that require control of loads that exceed individual dimmer rating. HDF load dimmers shall be used in conjunction with these DA amplifiers.
 - c. DA amplifiers shall be used in conjunction with HDF load dimmers for all dimming ballasts circuited at 277 volts AC.
 15. Neon/Cold Cathode Transformers
 - a. Dimmer shall be capable of dimming lamps to 10% of full output when used with normal (low) power factor transformers.
 - b. Dimmer shall be able to dim lamp free of flicker or striations over the entire dimming range.
 - c. Lamps suitable for dimming must be used for optimum performance.
 - d. It is the installing contractors' responsibility to insure that all lamps and wiring are as specified in manufacturer's product literature.
- E. Eight, Five and Two Scene Keypad Controls
1. Keypad shall be designer style device and shall gang with any designer style device.
 2. Keypad shall be line voltage (120VAC) with Hot, Neutral, Communication, and Ground. A single line voltage rated conductor (purple wire) shall be used as control data conductor.
 3. The five-scene keypad shall be capable of recalling five (5) presets and Off.
 4. The eight-scene keypad shall be capable of recalling eight (8) presets.
 5. The two-scene keypad shall be capable of recalling the On scene and Off.
 6. Keypad shall allow raise and lower of all dimmers on the system by holding the On or Off buttons on the Classic Series or the Raise/Lower arrows on the Ellipse Series (except eight scene keypad).
 7. Keypad push buttons shall be back lighted for locating button in a dark room.

8. Classic Series keypad shall have removable keycaps and be provided with a preprinted label sheet for labeling in the field. Ellipse Series keypad shall allow for optional factory custom engraving.
9. Manufacturer shall provide strap (MSP) and heatsink (MHP) type keypads.
10. Five and Two scene keypads shall display the On button when system is left in the Off scene and any dimmer or electronic switch is turned on (Feedback).

F. Channel Remotes

1. Channel remote shall be designer style device and shall gang with any designer style device.
2. Channel remote shall provide multi-location control of a single Multiset Pro dimmer. Remote shall provide all functions available at the dimming device with the exception of the "Learn" and LED indicators.
3. Channel remote shall have a built in red LED at the top of the trim ring for locating device while in an Off state.
4. Manufacturer shall not limit the number of channel remotes used with a single dimmer.
5. Channel remote shall be line voltage wired only.
6. Manufacturer shall provide strap (MSP) and heatsink (MHP) models.

G. Interface Control Options: Interface control shall be achieved by one or more of the following options:

1. Isolated momentary dry switch closures. When indicated on the drawings momentary dry switch closures shall be connected between the function being controlled and system ground. When momentary inputs are required at least one five scene keypad for each system being controlled must be specified as the AV suffix keypad. (MSP5AVES / MHP5AVES)
2. Astronomical time clock control inputs utilizing Lightolier Controls CLTCCO-MS time clock option. Where indicated on drawings, contractor to provide one line voltage conductor from each system to be controlled (up to nine) back to clock location. Time clock option will require a dedicated 120-volt AC feed.
3. Infrared receiver/transmitter, wall, and ceiling mounted, utilizing Lightolier Controls CLM-IRW/IRC wireless IR options. Where indicated on the drawing, contractor to pull eight 22 gauge Class 1 conductors from receiver to one (1) five-scene keypad location. Keypad must be specified as the AV suffix keypad (MSP5AVES / MHP5AVES).
4. Occupancy sensor utilizing Lightolier Controls wall and ceiling mounted detectors. Models CSOSLV (wall unit) and OSPSSYS with OSC (ceiling mount) shall be used to trigger a preset scene when the room is occupied and to turn lights off when room has been vacated. Occupancy system shall be configurable to provide manual/auto-on, adjustable time out, sensitivity, and coverage area. System shall have built in time delay after Off command is sent to allow occupant to exit the room. Where indicated on the drawings, contractor shall pull eight (8) 22 gauge Class 1 conductors from receiver (OSPSSYS / CSOSLV) to one (1) five-scene keypad location. Keypad must be specified as the audio-visual (AV) suffix keypad (MSP5AVES / MHP5AVES).

5. Serial communication EIA RS-232 utilizing Lightolier Controls MS232 interface. Where indicated on the drawings, contractor to provide one (1) 120 volt AC power circuit and pull one (1) line voltage conductor from system to be controlled. RS232 interface shall provide scene control and feedback in a standard ASCII format.
 - a. Interface shall be provided with setup software and a four-pin line voltage rated wall outlet for ease of installation. Interface shall be provided with LED indicators and push buttons for scene selection and troubleshooting.
 - b. Interface shall be EIA-485 compatible for linking multiple systems together on a single network. Interface shall be addressable to allow up to thirty (30) interfaces to be controlled from single communications port.

2.8 Brilliance II Lighting Control System

A. Brilliance II Control Center - BCCII

1. Housing shall be wall mounted and constructed of #14 gauge CRS measuring 12" wide by 16" tall by 4-1/8" deep, with antique white enamel finish.
2. A removable front panel shall provide access to all components and terminations from the front and serve as partition between low and high voltage sections of the BCCII.
3. No field assembly shall be required except for the insertion of interface cards.
4. Power and control terminals shall be of the tubular compression type and be clearly labeled for identification. The System shall operate either at 120/208 VAC 3 phase four wires with ground, 120/240 VAC single phase 3 wire with ground, or 120VAC single phase two wires with ground.
5. Brilliance II Control Center current draw shall not exceed one (1) Ampere and operate in an ambient temperature not to exceed one hundred four (104°) degrees Fahrenheit (40°C).
6. The system shall be capable of self-diagnostics.
7. Each BCCII shall be provided with twelve (12) card slots that can accept up to twelve system control cards.
8. Two (2) BCCII's can be combined in conjunction with six (6) MS232's to expand system capabilities to thirty (30) rooms.
9. The total number of Brilliance II Control Stations shall not exceed thirty (30) per system.
10. The BCCII shall be capable of interfacing with remote signaling devices such as security systems, building management systems, etc., provided an isolated (dry) momentary closure can be supplied by the signaling system.

B. Brilliance II Multiset Pro Interface Card (BRMSM): The BRMSM cards are intended to control only Multiset Pro systems using the Multiset Pro systems network ("purple wire"). The card shall have LED status indicator and test switches to activate and diagnose system.

C. Brilliance II Relay Input/Output Interface Card (BRRLY): The BRRLY relay interface card shall activate the four (4) relay outputs and provide the capability of configuring the four (4) relay inputs to activate a lighting scene or relay output.

- D. Brilliance II Communications Interface Card (BRCOMM): The BRCOMM communications interface card shall provide RS-232 and RS-485 interface from a personal computer by accepting standard ASCII commands to activate Brilliance II devices.
- E. Brilliance II Time Clock Interface Card (BRTLCK): The BRTLCK time clock interface, shipped with the Brilliance II Time Clock, is required when using the time clock and occupies one (1) slot.
- F. Brilliance II Programmable Control Stations
 1. Each designer style Brilliance II Control Station shall contain a set of illuminated buttons for On/Scene/Off control of single or multiple devices connected to the Brilliance II Control Center (BCC).
 2. Stations shall mount in a single gang wallbox or in a multi-gang box with other Brilliance II Control Stations or other compatible devices.
 3. All wiring shall be electrical low voltage and shall be wired and grounded in accordance with National Electrical Code and other local regulations.
 4. All Control Station buttons shall be field labeled with custom room identification engraving provided by manufacturer.
 5. Activated buttons shall have illuminated on / off status indication.
 6. There shall be no moving or protruding parts available to user once Control Station is installed.
- G. Compli Faceplates
 1. Faceplates shall have no visible screws and shall fit over all designer style control openings.
 2. Faceplates shall be compatible with Brilliance II, Onset, InSight, Multiset Pro, Compose PLC, Rockslide, Astral, and Sunrise dimmers and switches as well as other designer style wiring devices such as switches, receptacles, jacks, and controls supplied on this project.
 3. Faceplates shall be capable of covering dimmers, switches, and other devices ganged with preset control stations.
 4. Faceplates shall "snap-on" securely to back plate.
 5. Back plate shall have "self-aligning" tabs that center all devices automatically upon installation.
 6. Faceplates shall be made of durable impact-resistant plastic material.
 7. Faceplates shall be available in one through seven (1-7) gang configurations.
 8. Faceplates shall be available in the following colors:
 - a. White
 - b. Ivory
 - c. Black
 - d. Brown
 - e. Grey
 - f. Almond

2.9 Compose™ PLC Scene Preset Dimming System

A. General

1. Compose™ PLC shall provide an individual dimmer or centralized preset based lighting control.
2. Control protocol shall be two-way communication between individual components using a Power Line Carrier (PLC) based on the industry X-10 standard.
3. Control stations shall provide a button illumination to indicate status of controlled area or room.
4. Maximum quantity of devices on a single system shall not exceed six hundred forty (640) stations.
5. Dimmers and keypads shall be capable of accepting any one of two hundred fifty-six (256) unique addresses.
6. Control stations shall be available in Ellipse series and can be custom laser engraved or use the default label sequences.
7. Fade rates are specific to each programmed scene from instant On to one (1) hour.
8. Compose™ PLC Control Stations shall be available in either White, Ivory, or Almond finish color.

B. Compose™ PLC Firewall™

1. Housing shall be wall mounted and constructed of #16 GA CRS measuring 18" wide by 18" tall by 4 1/8" deep, with a white enamel finish.
2. A removable front panel shall provide access to all components and terminations from the front and serve as partition between low and high voltage sections of the Compose™ PLC Firewall™.
3. No field assembly other than normal wiring terminations shall be required.
4. Power and control terminals shall be of the tubular compression type and be clearly labeled for identification.
5. System shall operate either
 - a. 120/208 VAC, 3 phase, four wires
 - b. 120/240 VAC, single phase 3 wires
 - c. 120 VAC, single phase, two wires.
6. Compose™ PLC Firewall™ current draw shall not exceed 24 watts.
7. Operating temperature 0 to 40 degrees C.
8. The system shall be capable of self diagnostics.
9. Troubleshooting shall be possible by easily selecting DIP switches without use of special tools.
10. Additional Compose™ PLC Firewalls™ can be wired together to expand system capabilities using standard Cat5 cable.
11. The total number of devices shall not exceed ten (10) per Firewall™ circuit.

12. The Compose™ PLC Firewall™ shall be capable of interfacing with remote signaling devices (e.g. security systems) providing an isolated momentary closure can be supplied by the signaling system. Interface shall be via the Compose™ PLC Relay Card.
 13. Compose™ PLC Firewall shall be capable of interfacing with a computer via RS232 and the Compose™ PLC Communications Card.
- C. Compose™ PLC Preset (CP) Series Keypads
1. Each designer style Compose™ PLC Preset Keypads shall contain a set of illuminated buttons for control of a single room or area of single or multiple devices connected to the Compose™ PLC Firewall™. The keypad shall be capable of executing a sixteen (16) address command string.
 2. Stations shall mount in a single gang wallbox or in a multi-gang box with other Compose™ PLC keypads.
 3. Compose™ Preset Dimmers shall receive control signal only.
 4. Setting Preset Keypads and Dimmers to the same address shall permit them to operate as a group to the various lighting settings.
 5. All wiring shall be line voltage and shall be wired and grounded in accordance with National Electrical Code and other local regulations.
 6. Activated buttons shall have illuminated On / Off status indication.
 7. There shall be no moving or protruding parts available to user once Control Station is installed.
- D. Compose™ PLC Convertible (CC) Series Switches and Dimmers
1. Compose™ PLC Individual Series Switches shall provide control of single rooms or areas with only one or two light sources or larger spaces with several light sources.
 2. Devices shall mount in a single gang wallbox or in a multi-gang box with other Compose™ PLC devices or keypads.
 3. All wiring shall be line voltage and shall be wired and grounded in accordance with National Electrical Code and other local regulations.
 4. Activated buttons shall have illuminated On / Off status indication.
 5. Devices shall provide a red LED night light.
 6. There shall be no moving or protruding parts available to the User once the device is installed.
- E. Compose™ PLC Master (CM) Series Keypads
1. Compose™ PLC Master Series Keypads shall permit the control of individual or multiple rooms or areas at the same time.
 2. Master Series Keypads shall be programmable to provide:
 - a. Whole house control.
 - b. Individual room or area control.
 - c. Pathways of light.
 - d. Security, emergency, or panic settings.
 - e. Keypads shall be capable of executing a sixteen (16) address command string.

3. Verification signal received from the controlled devices shall be used to indicate by illuminating or blinking button the status of the controlled area.
4. Ellipse Series 5-Scene Master models (CM6BESPLC) shall be equipped with an infrared receiver capable of receiving preset selection signals from the hand-held infrared transmitter (CLMIRTES).
5. Stations shall mount in a single gang wallbox or in a multi-gang box with other Compose™ PLC keypads.
6. All wiring shall be line voltage and shall be wired and grounded in accordance with National Electrical Code and other local regulations.
7. Activated buttons shall have illuminated On / Off status indication.
8. There shall be no moving or protruding parts available to user once Control Station is installed.

F. Equipment List (quantities as shown in schedules, tables, and drawings):

- | | | | |
|-----|--|-----------------|--|
| 1. | CPLCFW8 | PLC Firewall™ | eight (8) 20 amp circuits |
| 2. | CC600VAPLC | Dimmer | 600VA (wattage capacity) |
| 3. | CC1000VAPLC | Dimmer | 1000VA (wattage capacity) |
| 4. | CC1000NDPLC | Non-Dim | 1000VA (wattage capacity) |
| 5. | CC600HDFPLC | HDF Dimmer | 600VA (wattage capacity) |
| 6. | CCWHISPLC | Fan Control | 1.5 amp / 3 speed |
| 7. | CC300VALAMP | Lamp Module | pluggable 300VA (wattage capacity) |
| 8. | CPR3 | Remote | Remote Multi-Location/3-way remote |
| 9. | CP5ESPLC | 5 Preset Master | Ellipse Series |
| 10. | CM6ESBPLC | 6 Button Master | Multi-Location Master - Ellipse Series |
| 11. | CM8ESBPLC | 8 Button Master | Multi-Location Master - Ellipse Series |
| 12. | CLMIRTES | Infrared | Hand-held Transmitter |
| 13. | Optional Remote, Time Clock, Engraving, Keychain Remote, Filters as specified. | | |

2.10 PowerSpec® HDF Ballast

- A. PowerSpec HDF Ballasts shall be available in lamp specific models to control a variety of common fluorescent sources.
- B. Ballasts control shall be controlled by Lightolier Controls PowerSpec® HDF direct drive dimmers, dimmer module, an applicable HDF amplifier, or other compatible interface.
- C. There shall be no perceived difference between the light levels of ballasts for the same type of lamp.
- D. Each ballast shall allow for smooth and continuous dimming down to between one and three (1-3%) percent lumen output dependent on lamp type, voltage to ballast, ambient temperature, initial lamp burn-in, and lamp life used or remaining.
- E. Each ballast shall accept line-voltage, three-wire control (hot, neutral, and signal).
- F. Input voltage: 120-volt or 277-volt, 50 Hz or 60 Hz.

- G. Comply with following industry standards:
 - 1. ANSI C82.11-1993 for ballast operation
 - 2. ANSI C62.41-1984 for transient protection
 - 3. FCC Part 18.C Class-A rating
 - 4. UL and CSA approved
- H. Ballast shall provide a high power factor that's greater than .97 at both full power and on low dim.
- I. Lamp current crest factor shall be less than 1.6.
- J. Ballasts shall provide a low THD of less than ten (10%) percent at full power and less than twenty (20%) percent on low dim.
- K. Equipment List (quantities as shown in schedules, tables, and drawings):
 - 1. T-8 Rapid-Start 120/277 volt 9.5 x 1.7 x 1.13 inches (24 x 4.3 x 3 cm)
 - 2. Linear T-5 Rapid Start 120/277 volt 16.7 x 1.18 x 1 inches (42.3 x 3 x 2.54 cm)
 - 3. T-5 Twin-Tube RS 120/277 volt 9.5 x 1.25 x 1.18 inches (24 x 4.3 x 3 cm)
 - 4. QT T-4 Quad and TTT Triple Tube Rapid Start 120/277 volt 5 x 3 x 1.18 inches (12.7 x 7.6 x 3 cm)

2.11 Dimming Amplifiers

- A. Dimming Amplifier shall provide control of a separate lighting circuit regardless of load phase.
- B. Control of the Dimming Amplifier shall be in conjunction with a Lightolier HDF-rated dimmer to provide input signaling.
- C. Input voltage: 106 – 132 VAC, 60 Hz.
- D. Output voltage: regulated to 0.5% per 10-volt line variation.
- E. Dimming Amplifiers shall be UL and cUL listed devices.
- F. Equipment List (quantities as shown in schedules, tables, and drawings):

1.	DA110QE120H 1000 watt	120 volt	incandescent/electronic low voltage
2.	DA22000VAH 2000 watt	120 volt	incandescent/MLV/cold cathode
3.	DA2400VAH 2400 watt	120 volt	incandescent/MLV/cold cathode
4.	DA10HDF 10 ampere	120/277v	PowerSpec® HDF Ballast
5.	DA20HDF120H 20 ampere	120 volt	PowerSpec® HDF Ballast
6.	DA20HDF277H 20 ampere	277 volt	PowerSpec® HDF Ballast
7.	DA2400EBH 2400 watt	120 volt	Mark 10 Ballast
8.	DA22000EBH 2x1536VA	120 volt	Mark 10 Ballast
9.	DA2400EB277H 1536VA	277 volt	Mark 10 Ballast
10.	DA22000EB277H 2x1536VA	277 volt	Mark 10 Ballast

2.12 Entertainment Technology IPS Intelligent Raceway

A. General

1. The Intelligent Raceway shall be a linear dimming system based on Insulated Gate Bipolar Transistor (IGBT) technology.
2. Each Intelligent Raceway shall be formed of cold-rolled steel sections. Exterior surfaces shall be finished in fine-textured, scratch-resistant powder coat paint. Interior surfaces shall have a corrosion-resistant finish.
3. Intelligent Raceway is fabricated from eight (8') foot long sections. Height of each section shall not exceed 6". Power and control termination head end section shall not exceed fifteen and one half (15.5") inches. Width of each section shall not exceed 3-1/2". Overall, length of combined sections shall not exceed ninety-six (96') feet long.
4. Local controls and displays shall be mounted adjacent to each dimmer pair in the Intelligent Raceway.
5. Intelligent Raceway shall produce no mechanical noise.
6. Intelligent Raceway dimming system shall meet or exceed FCC "Class A" standards for RFI/EMI emissions.
7. Each dimming system shall be listed by and labeled as Underwriters Laboratories Incorporated as Type 508 Industrial Control Equipment.

B. Electronics

1. Intelligent Raceway head-end electronics shall be housed in a permanently attached code-sized enclosure at one end of the Raceway.
2. The Intelligent Raceway standard control signal is 10BASE-T Ethernet running a TCP/IP based protocol. This incoming signal terminates in the head-end electronics. When used with a Capio™ Plus Dimmer Rack the protocol transmits 1024 discrete levels to the rack. The raceway in return transmits dimmer status data from its full complement of dimmers to the controller.
3. Each Intelligent Raceway shall include one permanently mounted RJ-45 jack to which the contractor shall land the incoming Ethernet control cable.
4. Each Intelligent Raceway shall accept one (1) optically isolated USITT DMX512/1990 protocol input on a standard 5-pin receptacle. Loop through connection shall also be provided.
5. Configuration of the Intelligent Raceway shall be performed by a PC-based program.

2.13 Entertainment Technology IPS Intelligent Raceway Dimmer Modules

A. General

1. Raceway Dimmer Modules shall use Insulated Gate Bipolar Transistor (IGBT) to regulate and control load voltage.
2. Dimmers using hard-switching SCR or other thyristor semiconductor devices shall not be acceptable.
3. Dimmers shall not use filter chokes to control the rate of rise in the load current waveform.

B. Electrical

1. Each dimmer module shall contain two (2) dimmers, each capable of controlling up to combined 2400 watt (20A) load. Total load capacity of each dimmer module pair shall be capped at 20 Amps (2400 watts). If the load capacity is exceeded, the module will automatically turn-off the last load energized.
2. Dimmer electronics shall be completely solid state.
3. The dimmers shall be immune from damage caused by output short-circuits between load and neutral or load and ground.

C. Performance

1. The insertion loss (voltage drop across the complete dimmer at full load current while producing a full output sine wave) shall be less than three volts RMS. Insertion loss at reduced dimmer loading shall not vary significantly from that produced with a full rated load. Dimmers with insertion loss greater than three volts RMS at full rated load shall not be acceptable.
2. The dimmers shall use Digital Power Envelope Processing to regulate dimmer output to within plus or minus 0.5 volts RMS of the assigned setting. Regulating response shall occur in the same power line cycle as the disturbance when the dimmer is in Reverse Phase Control (RPC) mode.
3. The IPS Intelligent Raceway shall return IPS Talkback™ information to the control console. The following information shall be reported:
 - a. Present power line voltage
 - b. Connected lamp wattage
 - c. Present output setting
 - d. Dimmer operating temperature
 - e. Dimming mode
 - f. Overload condition
 - g. No load condition
 - h. Focus mode
4. The dimmers shall hold last received level for a user pre-specified period, should the control signal be interrupted.
5. Dimmer Modules shall automatically switch from Reverse Phase Control (RPC) mode to Forward Phase Control (FPC) mode when inductive loads are detected. In RPC mode the dimmer is on from the beginning of the half-cycle until the desired output voltage is reached. In FPC mode, the dimmer turns on within the half-cycle and stays on until the end of the half-cycle. Use of RPC mode, when load type and other conditions permit, reduces the level of lamp filament noise.
6. LOW HARM™ mode shall reduce harmonic currents present on the feed neutral conductor by automatically switching the dimmers in the system to an optimum configuration of FPC and RPC operation. The reduction in neutral current shall be a minimum of 33% with a maximum of 100%, depending upon load sizes and their associated levels.

7. When in RPC mode, dimmer output voltage transition time is measured as "fall time". The actual "fall time" generated shall not be affected by the size of the load present. Dimmers shall provide a minimum fall time of 800 μ S under normal load current regardless of load.
 8. The dimmer transfer function shall comply with the industry standard Square Law dimming curve within a tolerance of plus or minus 0.5 Volts RMS for all incandescent loads.
 9. Each dimmer shall have an associated Focus push button that provides local ON/OFF/LEVEL control for focusing, maintenance, and other purposes. If the level set for a dimmer is zero, tapping the Focus button shall set the dimmer output to full. Pressing and holding the Focus button ramps the dimmer output up to any intermediate level. When a non-zero level is received from the controller, the dimmer shall return to normal operation. Tapping the Focus button, a second time shall also return the dimmer to normal operation. If a dimmer already has a non-zero level from the control desk, the Focus button flashes the dimmer to full output. In all cases, activating the Focus button shall be reported to the system operator, at the console or system monitor.
 10. Each dimmer shall have an LED display to facilitate local reporting of operating conditions.
 11. Each dimmer will detect operating conditions and take active measures to protect itself (and the load). Protective measures shall include, but are not limited to the following:
 - a. At power-up, each dimmer will detect line voltages in excess of 180 VAC. When over-voltage is detected, the dimmer will not turn on its load. The dimmer will also notify the operator via IPS Talkback™ and flash its locally mounted LED's. Dimmers shall withstand line voltages up to 230 VAC for an indefinite period and up to 280 VAC for fifteen minutes with no damage.
 - b. Each dimmer shall detect excessive heat sink operating temperatures and notify the console of the condition via IPS Talkback. The dimmer shall automatically reduce its own "fall time", which minimizes the production of heat. Dimmers will step from 800 μ S to 250 μ S. If heat continues to rise, the dimmer will shut down, notify the console via IPS Talkback, and flash its locally mounted LED's.
 - c. Each dimmer shall detect load current in excess of its own rating. An overload will cause a dimmer to shut down, notify the console, and flash its locally mounted LED's.
- D. Equipment List (quantities as shown in schedules, tables, and drawings):
1. IPS-IRW-(length)-(# dual dimmer modules)-(connector type)-(pigtail or flush)
 2. Hanger Types (required quantity is one plus one per five foot of length)
 - a. Single Pipe
 - b. Double Pipe
 - c. Wall Hanger
 3. **Requires Factory Engineering review due to Code requirements.**

2.14 Entertainment Technology IPS Distributed Dimming: Dimmer Strips

- A. IPS-DS-1206 and IPS-DS-2403 are self-contained dimming systems packaged as linear strips cooled by natural convection and operate without cooling fans or filters.
1. IPS-DS-1206 Dimmer Strip:
 - a. Six 1200-watt dimmers
 - b. Measure 5 x 3.5 x 87 inches (12.70 x 8.89 x 220.98 cm)
 - c. Weigh no more than 32 pounds (14.51 kg)
 2. IPS-DS-2403 Dimmer Strip
 - a. Three 2400-watt dimmers
 - b. Measure 5 x 4.25 x 58 inches (12.70 x 10.80 x 147.32 cm)
 - c. Weigh no more than 23 pounds (10.43 kg)
 3. Integrated suspension for fixtures and mounting adapters shall be continuous over the entire length of the top, bottom, and rear of the IPS-DS-1206 and IPS-DS-2403 linear strips.
- B. Distributed Dimming Dimmer Strips Product Features
1. Dimmer Modules shall use Insulated Gate Bipolar Transistor (IGBT) to regulate and control load voltage. Dimmers using hard-switching semiconductor devices, such as SCR's or other thyristors shall not be acceptable. The dimmers shall not use filter chokes to control the rate of rise in the load current waveform.
 2. The dimmers shall be immune to damage caused by output short-circuits between load and neutral or load and ground.
 3. The dimmers shall be immune to damage caused by hot patching of loads.
 4. Dimming system shall produce little or no mechanical noise.
 5. Each dimming system shall be capable of automatically compensating for excessive neutral currents.
 6. Dimmer Modules shall provide compatible dimming control of the following load types:
 - a. Incandescent / Quartz Halogen
 - b. Cold cathode / Neon
 - c. Electronic low-voltage
 - d. Magnetic low-voltage
 - e. Fluorescent 2-wire ballasts (Advance® Mark 10)
 7. Each dimming system shall be powered by:
 - a. three-phase 4W 120/208 Volt AC 50/60 Hz, one (1) 20 amp electrical circuit or
 - b. single-phase 3W 120/240 Volt AC 50/60 Hz, three (3) 20 amp electrical circuits
 - c. Power feed to each dimming system shall be provided through rigid conduit, flexible conduit, or flexible Type SO cable and connector.
 8. Individual dimmer modules shall operate correctly on line voltage from 90-140VAC, 50/60 Hz. The dimmer shall adapt in real time to changes in input frequency up to plus or minus 8 Hz.

9. Dimmer output voltage shall be unaffected by severely distorted or noisy power line waveforms. Zero cross detection to synchronize dimmer to the power line frequency is not acceptable.
10. Dimming system shall include local controls and displays mounted on its enclosure.
11. Dimming system shall meet or exceed FCC "Class A" standards for RFI/EMI emissions.
12. Dimming system shall be listed by Underwriters Laboratories Incorporated as Type 508 Industrial Control Equipment, and so labeled.
13. In normal operating mode, each dimmer shall use Reverse Phase Control (RPC). In RPC mode, the dimmer is on from the beginning of the half-cycle until the desired output voltage is reached. Use of RPC mode, when load type and other conditions permit, reduces the level of lamp noise.
14. When in RPC mode, dimmer output voltage transition time is measured as "fall time". The actual "fall time" generated shall not be affected by the size of the load present. Dimmers shall provide the following nominal fall (transition) time under normal load current:
 - a. 1200-watt dimmers: 450 microseconds
 - b. 2400-watt dimmers: 800 microseconds
15. Dimmer Modules shall automatically switch from Reverse Phase Control (RPC) mode to Forward Phase Control (FPC) mode when inductive loads are detected. In FPC mode, the dimmer turns on within the half-cycle and stays on until the end of the half-cycle.
16. The dimmers shall use "Digital Power Envelope Processing" to regulate dimmer output to within plus or minus 0.5 volts RMS of the assigned setting. Regulating response shall occur in the same power line cycle as the disturbance when the dimmer is in Reverse Phase Control (RPC) mode.
17. The dimmer transfer function shall comply with the industry standard Square Law dimming curve within a tolerance of plus or minus 0.5 Volts RMS for all incandescent loads.
18. The insertion loss (voltage drop across the complete dimmer at full load current while producing a full output sine wave) shall be three (3V) volts RMS or less. Insertion loss at reduced dimmer loading shall not vary significantly from that produced with a full rated load. Dimmers with insertion loss greater than three (3V) volts RMS at full rated load shall not be acceptable.
19. LOW HARM™ mode shall reduce harmonic currents present on the feed neutral conductor by automatically switching the dimmers in the system to an optimum configuration of FPC and RPC operation. The reduction in neutral current shall be a minimum of 33% with a maximum of 100%, depending upon load sizes and their associated levels.
20. Each dimmer will detect operating conditions and take active measures to protect itself (and associated load). Protective measures shall include, but are not limited to the following:
 - a. At power-up, each dimmer will detect line voltages in excess of 180 VAC. When over-voltage is detected, the dimmer will not turn on its load. The dimmer will also notify the Horizon Console operator via Talkback™ over the DMX512 network and

- flash its locally mounted LED's. The dimmers shall withstand line voltages up to 230 VAC for an indefinite period and up to 280 VAC for fifteen minutes with no damage.
- b. Each dimmer shall detect excessive heatsink operating temperatures and notify the Horizon Console of the condition. The dimmer shall automatically reduce its own voltage transition time (rise time or fall time), which minimizes the production of heat. 2400-watt dimmers will step without visible light level changes from 800 microseconds to 450 microseconds and then to 250 microseconds if heat continues to rise. 1200-watt dimmers will step from 450 to 250 microseconds. If these measures fail to reduce the temperature, the dimmer will shut down, notify the Horizon Control Console via Talkback™, and flash its locally mounted red LED.
 - c. Each dimmer shall detect load current in excess of its own rating. An overload will cause a dimmer to shut down, notify the Horizon Console via Talkback™, and flash its locally mounted red LED.
21. Each self-contained dimming system shall include a processor with three push buttons and a numeric LED display, used to set the DMX512 device address, execute self-test diagnostics, and to select special operating modes. Functions provided shall include:
- a. Address Selection - Used to display and update the start address for that unit, for DMX512 console connections.
 - b. Playback Preset - Used to display and select which locally recorded preset, if any, will be activated on power-up.
 - c. Local - Used to temporarily disable level information sent from the console. Allows control of each dimmer's level to be set at the processor.
 - d. Record Preset - Used to record as many as six presets with level information coming from the console, from Local mode, or from the Focus buttons.
 - e. Dimmer Preheat - Used to supply preheat voltage to lamp filaments, even when dimmers are set to zero. Preheating high wattage lamps can improve response time and increase lamp life.
 - f. Dimmer Response Time - Used to select one of eight available dimmer response time settings. Available settings range from 200 milliseconds to 550 milliseconds. An "as fast as possible" (immediate response) setting shall also be available.
 - g. Display Console Data - Used to display current level information supplied to the dimmers by the console.
 - h. Non-Dim Configuration - Used to configure any dimmer as a non-dim.
 - i. Diagnostic Error Report - Used to display errors or anomalies detected by system self-test diagnostics at initial power-up.
- C. The system shall accept an optically isolated USITT DMX512/1990 protocol input on a permanently mounted 5-pin XLR style connector. Loop through connections shall also be provided.
- D. Dimmer modules shall be compatible with the USITT DMX512/1990 control protocol. The dimmers shall return status information (Talkback™) to the Horizon Control Console via the second wire pair (second data link) in the DMX512 cable. The following information shall be reported:

- a. Present power line voltage
 - b. Connected lamp wattage
 - c. Present output setting
 - d. Dimmer operating temperature
 - e. Dimming mode
 - f. Overload condition
 - g. No load condition
 - h. Focus Mode
2. The dimmers shall hold the last received level for a user pre-specified period if the DMX512 control signal is interrupted.
 3. Provide an associated Focus push button that provides local ON/OFF/LEVEL control for focusing, maintenance, and other purposes. If the level set for a dimmer is zero, tapping the Focus button shall set the dimmer output to full. Pressing and holding the Focus button ramps the dimmer output up to any intermediate level. When a non-zero level is received from the controller, the dimmer shall return to normal operation. Tapping the Focus button, a second time shall also return the dimmer to normal operation. If a dimmer already has a non-zero level from the control desk, the Focus button flashes the dimmer to full output. In all cases, activating the Focus button shall be reported to the system operator at the Horizon Console or system monitor via Talkback™.
 4. Each dimmer shall have two adjacent LED's to facilitate local reporting of operating conditions. The following indications shall be given:
 - a. Both LED's dark = Normal Operation
 - b. Green LED flashing = No Load
 - c. Green LED solid = Focus Mode
 - d. Red LED flashing quickly = Overload Shutdown
 - e. Red LED flashing slowly = Over Temperature
 - f. Red LED solid = Other Errors
 - g. Both LED's flashing = Input voltage greater than 180 VAC at power-up.
 5. The IPS dimming system shall allow individual dimmer configuration over the DMX512/1990 protocol signal from the lighting control console using the IPS Remote Commands™ set. Modes which may be set remotely include:
 - a. Dimmer curve (Linear or Square Law)
 - b. Phase control (Normal / Forward / LOW HARM)
 - c. Rise/Fall time (Normal / Reduced)
 - d. Non-Dim (Disabled/Enabled / Threshold Level)
 - e. Preheat lamp filaments (Disabled / Enabled)
 - f. Dimmer response (fastest / controlled time setting)
 - g. DMX512 Hold time on loss of data
 - h. Output voltage maximum (120 volt / 115 volt)

- E. Equipment List (quantities as shown in schedules, tables, and drawings):
 - 1. IPS-DS-1206 IPS Dimmer Strip - Six 1.2 kW dimmers
 - 2. IPS-DS-2403 IPS Dimmer Strip - Three 2.4 kW dimmers
- 2.15 Entertainment Technology IPS Distributed Dimming: Dimmer Enclosures
 - A. IPS-DB-1206 and IPS-DB-2403 are self-contained dimming systems packaged as a lightweight and compact boxes cooled by a single low noise fan.
 - 1. IPS-DB-1206 Dimmer Enclosure
 - a. Six 1200-watt dimmers,
 - b. Measure 4.625 x 13 x 19.75 inches (11.75 x 33.02 x 50.17 cm)
 - c. Weigh no more than 22 pounds (9.98 kg)
 - 2. IPS-DB-2403 Dimmer Enclosure
 - a. Three 2400-watt dimmers
 - b. Measure 4.625 x 13 x 19.75 inches (11.75 x 33.02 x 50.17 cm.)
 - c. Weigh no more than 18 pounds (8.16 kg)
 - B. IPS-DR-2406 is a self-contained dimming system packaged as a lightweight and compact assembly consisting of up to six (6) 20 ampere dimmers with individual 20A circuit breakers packaged in a wall mount panel cooled by natural convection without cooling fans or filters.
 - 1. Six 2400-watt dimmers (rated for a 1920 watt continuous load)
 - 2. Measure 13.375 x 34.625 x 6.25 inches
 - 3. Weigh no more than 45 pounds
 - C. Distributed Dimming Enclosure Features
 - 1. Dimmer Modules shall use Insulated Gate Bipolar Transistor (IGBT) to regulate and control load voltage. Dimmers using hard-switching semiconductor devices, such as SCR's or other thyristors shall not be acceptable. The dimmers shall not use filter chokes to control the rate of rise in the load current waveform.
 - 2. The dimmers shall be immune to damage caused by output short-circuits between load and neutral or load and ground.
 - 3. The dimmers shall be immune to damage caused by hot patching of loads.
 - 4. Dimming system shall produce nominal or no mechanical noise.
 - 5. Each dimming system shall be capable of automatically compensating for excessive neutral currents.
 - 6. Dimmer Modules shall provide compatible dimming control of the following load types:
 - a. Incandescent / Quartz Halogen
 - b. Cold cathode / Neon
 - c. Electronic low-voltage
 - d. Magnetic low-voltage
 - e. Fluorescent 2-wire ballasts (Advance® Mark 10)
 - 7. Each dimming system shall be powered by:

- a. Three-phase 4 wire 120/208 Volt AC 50/60 Hz, or
 - b. single-phase 3 wire 120/240 Volt AC 50/60 Hz.
 - c. Power feed to each dimming system shall be provided through rigid conduit, flexible conduit, or flexible Type SO cable and connector.
8. Individual dimmer modules shall operate correctly on line voltage from 90-140VAC, 50/60 Hz. The dimmer shall adapt in real time to changes in input frequency up to plus or minus 8 Hz.
 9. Dimmer output voltage shall be unaffected by severely distorted or noisy power line waveforms. Zero cross detection to synchronize dimmer to the power line frequency is not acceptable.
 10. Dimming system shall include local controls and displays mounted on its enclosure.
 11. Dimming system shall meet or exceed FCC "Class A" standards for RFI/EMI emissions.
 12. Dimming system shall be listed by Underwriters Laboratories Incorporated as Type 508 Industrial Control Equipment, and so labeled.
 13. In normal operating mode, each dimmer shall use Reverse Phase Control (RPC). In RPC mode, the dimmer is on from the beginning of the half-cycle until the desired output voltage is reached. Use of RPC mode, when load type and other conditions permit, reduces the level of lamp noise.
 14. When in RPC mode, dimmer output voltage transition time is measured as "fall time". The actual "fall time" generated shall not be affected by the size of the load present. Dimmers shall provide the following nominal fall (transition) time under normal load current:
 - a. 1200-watt dimmers: 450 microseconds
 - b. 2400-watt dimmers: 800 microseconds (450 microseconds for IPS-DR-2406)
 15. Dimmer Modules shall automatically switch from Reverse Phase Control (RPC) mode to Forward Phase Control (FPC) mode when inductive loads are detected. In FPC mode, the dimmer turns on within the half-cycle and stays on until the end of the half-cycle.
 16. The dimmers shall use "Digital Power Envelope Processing" to regulate dimmer output to within plus or minus 0.5 volts RMS of the assigned setting. Regulating response shall occur in the same power line cycle as the disturbance when the dimmer is in Reverse Phase Control (RPC) mode.
 17. The dimmer transfer function shall comply with the industry standard Square Law dimming curve within a tolerance of plus or minus 0.5 Volts RMS for all incandescent loads.
 18. The insertion loss (voltage drop across the complete dimmer at full load current while producing a full output sine wave) shall be three (3V) volts RMS or less. Insertion loss at reduced dimmer loading shall not vary significantly from that produced with a full rated load. Dimmers with insertion loss greater than three (3V) volts RMS at full rated load shall not be acceptable.
 19. LOW HARM™ mode shall reduce harmonic currents present on the feed neutral conductor by automatically switching the dimmers in the system to an optimum configuration of FPC and RPC operation. The reduction in neutral current shall be a

- minimum of 33% with a maximum of 100%, depending upon load sizes and their associated levels.
20. Each dimmer will detect operating conditions and take active measures to protect it (and associated load). Protective measures shall include, but are not limited to the following:
 - a. At power-up, each dimmer will detect line voltages in excess of 180 VAC. When over-voltage is detected, the dimmer will not turn on its load. The dimmer will also notify the Horizon Console operator via Talkback™ and flash its locally mounted LED's. The dimmers shall withstand line voltages up to 230 VAC for an indefinite period and up to 280 VAC for fifteen minutes with no damage.
 - b. Each dimmer shall detect excessive heatsink operating temperatures and notify the Horizon Console of the condition. The dimmer shall automatically reduce its own voltage transition time (rise time or fall time), which minimizes the production of heat. 2400-watt dimmers will step without visible light level changes from 800 microseconds to 450 microseconds and then to 250 microseconds if heat continues to rise. 1200-watt dimmers will step from 450 to 250 microseconds. If these measures fail to reduce the temperature, the dimmer will shut down, notify the Horizon Console via Talkback™, and flash its locally mounted red LED.
 - c. Each dimmer shall detect load current in excess of its own rating. An overload will cause a dimmer to shut down, notify the Horizon Console via Talkback™, and flash its locally mounted red LED.
 21. Each self-contained dimming system shall include a processor with three push buttons and a numeric LED display, used to set the DMX512 device address, execute self-test diagnostics, and to select special operating modes. Functions provided shall include:
 - a. Address Selection - Used to display and update the start address for that unit, for DMX512 console connections.
 - b. Playback Preset - Used to display and select which locally recorded preset, if any, will be activated on power-up.
 - c. Local - Used to temporarily disable level information sent from the console. Allows control of each dimmer's level to be set at the processor.
 - d. Record Preset - Used to record as many as six presets with level information coming from the console, from Local mode, or from the Focus buttons.
 - e. Dimmer Preheat - Used to supply preheat voltage to lamp filaments, even when dimmers are set to zero. Preheating high wattage lamps can improve response time and increase lamp life.
 - f. Dimmer Response Time - Used to select one of eight available dimmer response time settings. Available settings range from 200 milliseconds to 550 milliseconds. An "as fast as possible" (immediate response) setting shall also be available.
 - g. Display Console Data - Used to display current level information supplied to the dimmers by the console.
 - h. Non-Dim Configuration - Used to configure any dimmer as a non-dim.
 - i. Diagnostic Error Report - Used to display errors or anomalies detected by system self-test diagnostics at initial power-up.

22. The system shall accept an optically isolated USITT DMX512/1990 protocol input on a permanently mounted 5-pole screw terminal block (DR) or 5-pin XLR style connectors (DB). Loop through connections shall also be provided.
23. Dimmer modules shall be compatible with the USITT DMX512/1990 control protocol. The dimmers shall return status information (Talkback™) to the Horizon Control Console via the second wire pair (second data link) in the DMX512 cable. The following information shall be reported:
 - a. Present power line voltage
 - b. Connected lamp wattage
 - c. Present output setting
 - d. Dimmer operating temperature
 - e. Dimming mode
 - f. Overload condition
 - g. No load condition
 - h. Focus Mode
24. The dimmers shall hold the last received level for a user pre-specified period if the DMX512 control signal is interrupted.
25. Provide an associated Focus push button that provides local ON/OFF/LEVEL control for focusing, maintenance, and other purposes. If the level set for a dimmer is zero, tapping the Focus button shall set the dimmer output to full. Pressing and holding the Focus button ramps the dimmer output up to any intermediate level. When a non-zero level is received from the controller, the dimmer shall return to normal operation. Tapping the Focus button, a second time shall also return the dimmer to normal operation. If a dimmer already has a non-zero level from the control desk, the Focus button flashes the dimmer to full output. In all cases, activating the Focus button shall be reported to the system operator at the Horizon Console or system monitor via Talkback™.
26. Each dimmer shall have two adjacent LED's to facilitate local reporting of operating conditions. The following indications shall be given:
 - a. Both LED's dark = Normal Operation
 - b. Green LED flashing = No Load
 - c. Green LED solid = Focus Mode
 - d. Red LED flashing quickly = Overload Shutdown
 - e. Red LED flashing slowly = Over Temperature
 - f. Red LED solid = Other Errors
 - g. Both LED's flashing = Input voltage greater than 180 VAC at power-up.
27. The IPS dimming system shall allow individual dimmer configuration over the DMX512/1990 protocol signal from the lighting control console using the IPS Remote Commands™ set. Modes which may be set remotely include:
 - a. Dimmer curve (Linear or Square Law)
 - b. Phase control (Normal / Forward / LOW HARM)

- c. Rise/Fall time (Normal / Reduced)
- d. Non-Dim (Disabled/Enabled / Threshold Level)
- e. Preheat lamp filaments (Disabled / Enabled)
- f. Dimmer response (fastest / controlled time setting)
- g. DMX512 Hold time on loss of data
- h. Output voltage maximum (120 volt / 115 volt)
- i. Fan On (DB only)

D. Equipment List (quantities as shown in schedules, tables, and drawings):

- 1. IPS-DB-1206 IPS Dimmer Box - Six 1.2 kW dimmers
- 2. IPS-DB-2403 IPS Dimmer Box - Three 2.4 kW dimmers
- 3. IPS-DR-2406 IPS Dimmer Panel - Six 2.4 kW dimmers (rated for 1920 watt continuous load)

2.16 Compli Scenist Master Stations

- A. Master control stations shall be programmable microprocessor based devices with no user accessible moving parts.
- B. Master Control shall include, but not be limited to, the following functions or features:
 - 1. Scene selection pushbuttons.
 - 2. On and Off pushbuttons.
 - 3. Programmable fade rate control.
 - 4. Individual channel intensity control pushbuttons.
 - 5. Set or learn pushbutton to program scenes.
 - 6. Non-dim channel program function to field program a dimmer channel into a non-dim switch.
 - 7. "Panel Lock" to prevent unwanted tampering of preset lighting levels.
 - 8. Master Raise/Lower pushbuttons to adjust intensity of all lighting channels.
 - 9. Master control station shall allow manual intensity overrides at any time. Manual overrides shall be defined as the ability to alter the intensity of any number of channels without affecting scene memory and without affecting the intensity of all channels that are not to be overridden. This shall not require a "Take Control" button press.
 - 10. All memory shall be retained for a minimum of ten (10) years in the event of power failure. This shall be accomplished without batteries. Upon restoration of power the master control shall return to the last selected scene.
 - 11. There shall be no slide potentiometers.
 - 12. Each scene shall have a unique programmable fade rate.
 - 13. All scenes and channels shall be field labeled and modified with graphics supplied by the manufacturer.
 - 14. Scene selection will activate the fade. A second press of the scene pushbutton will bypass the fade and activate an instantaneous scene change. All control stations shall indicate when a fade is in progress.

C. Compli Scenist Master Control shall incorporate the following features:

1. 5 programmable scenes plus Off,
2. Illuminated scene button indicators shall glow to facilitate location in a dark room.
3. An addressable, four conductor network bus (LAN) port to allow selected masters and network remotes to operate simultaneously. This port shall be field programmable.
4. Station shall be capable of "Automatic Cycling" - sequencing from scene to scene at each scene's programmable rate.
5. Proper number of channels as indicated on electrical schedule(s). Stations shall be capable of jobsite configuration to a lesser number of channels or expandable to 8 channels.
6. Adjustable fade rate from instantaneous to 1 hour transition.
7. Station shall be capable of "Selective Learn Lock"-the ability to prevent un-wanted reprogramming of any or all scenes.
8. Station shall have a "Reversible Control Panel"-the ability to be mounted upside down to conform to job conditions. All push buttons and indicators shall be field configurable to match the mounting mode.
9. Station shall have "Alarm Mode" – the capability of interfacing with external alarm or security systems.
10. Station shall have "Channel Exclusion"-the ability of certain channels to ignore certain scene changes.
11. Station shall have "Selective Channel Mastering" - the ability to manually adjust selected channels from other locations.
12. Control surface panel shall be covered with hinged full rotation door.
13. All stations shall have scene select sections that match the size and appearance of designer style wiring devices. Screwless faceplates may be used throughout the interior of the project to afford a matched appearance.
14. It shall be possible to install other designer style wiring devices adjacent to master control stations to combine both elements under screwless multi-gang faceplates.

D. Compli Scenist Master control station shall include:

1. Four silicon controlled rectifier dimmers capable of carrying a load of 800W each, for a total of 2000W per master.
2. Each dimmer shall be able to control the following types of loads: incandescent, magnetic low voltage incandescent, neon/cold cathode (low power factor).
3. Master stations shall be fed by a dedicated 20 Amp circuit.

E. Master stations shall flush mount into a 4" wall construction and shall not exceed the following dimensions:

1. 4.5" X 8" for a 5 scene, 4 channel master.

2.17 Compli Scenist Remote Control Stations

A. Remote control stations shall consist of scene remotes or channel remotes.

- B. Wall mounted remotes shall be flush mounted into a standard single gang rough-in box (contractor supplied). Remotes with more than 5 scenes shall mount into standard multiple gang rough-in boxes.
- C. All wiring to discrete remotes shall have a voltage rating of no less than 300 Volts. Contractor shall ensure that remotes are properly grounded to earth ground per N.E.C. requirements.
- D. All remotes shall be field labeled and modified with graphics supplied by the manufacturer.
- E. Activated scenes shall have illuminated scene indication.
- F. There shall be no slide potentiometers.
- G. Compli Scenist Remotes shall incorporate the following features:
 - 1. Illuminated scene buttons shall glow to facilitate location in a darkened room.
 - 2. Channel remotes shall be capable of manually controlling any or all channels. This shall be field programmable.
 - 3. All remotes shall have scene or channel select sections that match the size and appearance of designer style wiring devices. Screwless faceplates may be used throughout the interior of the project to afford a matched appearance.
 - 4. It shall be possible to install other designer style wiring devices adjacent to remote control stations to combine both elements under screwless multi-gang faceplates.
 - 5. The following remote(s) shall be located as indicated on the drawings:
 - a. 5 Scene Remote plus Off.
 - b. 2 Scene Remote.

2.18 Onset® Electronic Dimming

- A. Controls shall be designer style 600-watt or 1000-watt "strap" models and 600-watt, 1000-watt, 1500-watt, or 2000-watt thin profile "heatsink" models. Either style shall be available to control incandescent, magnetic or electronic (300-watt) low voltage, neon/cold cathode, fan loads, and switched loads. Onset® 2-wire "LV" models shall not require neutral connection to control low voltage incandescent magnetic loads.
- B. Controls shall be capable of "learning" a preset level and recalling that preset level with a single touch of the switch.
- C. "Learned" preset shall not be affected by interim changes to light level (manual override).
- D. Dimmers shall return to exact last level after a power failure.
- E. Lights shall fade to the preset or fade off with a single touch of the switch.
- F. It shall be possible to quickly raise the dimmer to full intensity or to off by "double tapping" the control switch.
- G. Dimmers shall have an LED indicator bar to display preset level and relative intensity of dimmer output.
- H. Remote stations shall be capable of performing all the functions of the main control.
- I. It shall be possible to control up to four (4) dimmers or switches simultaneously with a master control.

2.19 InSight® Occupancy Sensing Systems

A. InSight® Low Voltage Sensor Switch (OSW)

1. The InSight® Low-Voltage Sensor Switch is a designer-style, passive infrared, occupancy sensing wall switch.
2. Sensor shall have a viewing area of not less than one hundred seventy (170°) degrees at a distance of thirty (30') feet.
3. Each unit shall provide manual on or automatic on/off operation.
4. InSight® Sensor Switch shall permit and adjustable time-out period allowing the user to set the length of time in which the lights are to remain on after a room is vacated.
5. Each unit shall provide a LED indicator which glows lightly in the dark for easy location and provides indication when the sensor detects movement.
6. InSight Sensor Switch may be used in conjunction with one or more InSight System Power Packs.
7. Combination of wall- and ceiling-mounted sensors may be used.

B. InSight® Low Voltage Ceiling Mounted Sensor Switch (OSC)

1. The InSight® Low-Voltage Ceiling Sensor is a passive infrared, occupancy sensing switch.
2. Each unit shall provide manual on or automatic on/off operation.
3. InSight® Ceiling Sensor shall contain a user adjustable integral photocell capable of measuring the availability of natural light and preventing the system from turning on if sufficient natural light is present.
4. InSight® Sensor Switch shall permit and adjustable time-out period allowing the user to set the length of time in which the lights are to remain on after a room is vacated.
5. Each unit shall provide a LED indicator which glows lightly in the dark for easy location and provides indication when the sensor detects movement.
6. InSight Sensor Switch may be used in conjunction with one or more InSight System Power Packs.
7. Combination of wall- and ceiling-mounted sensors may be used.

C. InSight® Power Packs (OSPS-10A / OSPS-20A)

1. The ® Power Pack units are rated to interface with InSight® low-voltage wall and ceiling mounted sensors.
2. Sensor shall have a viewing area diameter of not less than twenty-five (25') feet over three hundred sixty (360°) degrees at a mounting height of ten (10') feet.
3. Each InSight® Power Pack shall interface with up to twelve (12) sensors.
4. Each Power Pack shall have a user adjustable time-out period range of twenty (20) seconds to thirty (30) minutes.
5. Power Pack shall provide either Manual On or Auto On and Auto Off.
6. Three (3) Power Packs shall be capable of receiving a control signal from a single InSight sensor unit.
7. InSight® Power Packs shall be capable of handling:
 - a. Incandescent / Quartz Halogen

- b. Cold cathode / Neon
 - c. Electronic low-voltage
 - d. Magnetic low-voltage
 - e. Fluorescent 2-wire ballasts (Advance® Mark 10)
8. The InSight® Power Pack is a steel junction box measuring 4 x 4 x 2 ¼ inches.
 9. Mounting shall be to an existing junction box by means of an integral 1/2" nipple.
 10. Low-voltage control terminations shall be made in the junction box provided.
 11. Models #OSPS-10A/20A-120 are UL Listed to U.S. and Canadian standards for a 120V capacity.
 12. Models #OSPS-10A/20A-277 are UL Listed to U.S. and Canadian standards for a 277V capacity.

2.20 Insight Switch and Dimmer

- A. Switched Device shall be 120VAC or 277VAC, 60Hz. and rated to control 600-watt, 1000-watt, or 2000-watt of incandescent, magnetic low voltage, neon/cold cathode, or inductive lighting loads.
- B. Dimmer Device shall be 120VAC, 60Hz and rated to control of incandescent, magnetic low voltage, neon/cold cathode and inductive lighting loads.
- C. Control shall contain a dual element passive infrared detector and multi-faceted Fresnel lens system. Device operations include on, off and automatic off when the space is vacated and the timeout period has elapsed. It can accept on/off commands from an unlimited number of multi-location Insight Remotes.
- D. Device detection field shall cover an area of approximately 750 sq. ft. with a minimum field of view of 170 degrees and an axial range of 25 ft.
- E. Device shall be designer style and have a red LED that indicates when unit is being triggered and glows when Off to facilitate location in a dark room.
- F. Device shall emit a warning tone before automatically turning Off.
- G. Device shall be supplied with masking labels that reduce the field of view to 60, 90, or 120 degrees.
- H. Device shall incorporate an adjustable time-out period from 2 – 15 minutes.
- I. Remote stations shall provide multi-location On to Preset / Off control of the dimmer using conventional 3-way wiring.
- J. Device shall mount in a single gang wallbox and be gangable with other designer style electrical devices and faceplates.
- K. A designer style screwless faceplate shall be supplied in White or Ivory.

2.21 Momentum Dimmer

- A. Control shall be capable of handling 600-watt to 2000-watt incandescent, magnetic low voltage incandescent, electronic low voltage (max.625 watt), fan loads, neon/cold cathode, non-dim, and electronic fluorescent with approved dimming ballasts.

- B. Preset model shall have a preset pushbutton to allow for turning on and off at a pre-determined level.
- C. Preset model shall have a red LED indicator light on the pushbutton to facilitate location in an Off state.
- D. Slide knob shall be integral to the dimmer to prevent loss.
- E. Preset model shall be capable of being mastered to turn on and off with other Momentum preset controls without the use of relays.
- F. Heatsink devices include individual screwless faceplate.
- G. Control shall not exceed 3/8" in thickness.

2.22 Sunrise Preset Incandescent Dimmer

- A. The Sunrise Preset Strap Type Incandescent Dimmer is a designer-style, preset slide dimmer, developed for low-wattage (600-watt to 1000-watt) use to control incandescent, magnetic or electronic low voltage, fluorescent, and fan loads. The unit is equipped with an off-status LED and provides both three-way and multi-location On/Off control when used with Sunrise Preset Remotes.
- B. Dimmer:
 - 1. Streamlined appearance and operations.
 - 2. A red LED light—to help locate the push button when the unit is turned off.
 - 3. The integral slide knob has extended travel for full-range dimming control.
 - 4. Soft Start—turns the dimmer on gradually to preserve lamp life.
 - 5. Air Gap switch shall be provided to completely open the attached circuit.
 - 6. Three-way and multi-location or master control when used with Sunrise Preset Remotes.
- C. Remote:
 - 1. Streamlined appearance and operations.
 - 2. Turns Sunrise Preset Dimmers on, to a preset level, and off.
 - 3. Allows complete control of all dimming capabilities when used with Sunrise Preset Dimmers, even from additional locations.
 - 5. Unlimited remotes can be used for multi-location control.
 - 6. One remote has the ability to master Sunrise Presets.
- D. Available in six (6) colors using optional Compli Screwless Faceplate color kits.
 - 1. White
 - 2. Almond
 - 3. Ivory
 - 4. Black
 - 5. Brown
 - 6. Grey
 - 7.

2.23 Vega Heatsink Slide Dimmer

- A. Vega Heatsink Slide Dimmers shall be capable of handling 600-watt to 2000-watt incandescent magnetic/electronic low voltage, fluorescent, and non-dim lighting loads.
- B. Power-failure memory shall return lights to same level set prior to power interruption.
- C. Slide knob shall be integral to the dimmer to prevent loss.
- D. Air Gap switch shall be provided to completely open the attached circuit.
- E. Control shall be capable of withstanding current and voltage surges in accordance with ANSI/IEEE C62.41-1980.
- F. Vega Slide Dimmer mounts in a single-gang wall box.
- G. Control shall not exceed 5/8" in thickness.
- H. Available in six (6) colors using optional Compli Screwless Faceplate color kits.
 - 1. White
 - 2. Almond
 - 3. Ivory
 - 4. Black
 - 5. Brown
 - 6. Grey

I. Equipment List (quantities as shown in schedules, tables, and drawings):

1.	V600	600 watt	120 volt	incandescent
2.	V1000	1000 watt	120 volt	incandescent
3.	V1500	1500 watt	120 volt	incandescent
4.	V2000	2000 watt	120 volt	incandescent
5.	V1000LV	1000 watt	120 volt	2 wire low voltage
6.	V2000LV	2000 watt	120 volt	2 wire low voltage
7.	V600VAU	600 watt	120/277 volt	3 wire low voltage
8.	V1000VAU	1000 watt	120/277 volt	3 wire low voltage
9.	V2000VAU	2000 watt	120/277 volt	3 wire low voltage
10.	V500QE	500 watt	120 volt	3 wire electronic low voltage
11.	V2000NDU	2000 watt	120/277 volt	3 wire non-dim
12.	V2000HDFU	2000VA	120/277 volt	3 wire fluorescent
13.	V2000FAMU	2000VA	120/277 volt	4 wire fluorescent
14.	V1500EBU	1500VA	120/277 volt	3 wire fluorescent

PART 3 - EXECUTION

3.1 INSTALLATION OF DIMMING AND LIGHTING CONTROL SYSTEMS:

- A. General: Install lighting control system devices where indicated, in accordance with manufacturer's written instructions and project Shop Drawings, applicable requirements of NEC, and recognized industry practices to ensure that products serve intended function.

- B. Box Condition: Install low voltage lighting control devices only in electrical boxes which are clean, free from excess building materials, debris, and similar matter.
- C. Cabinets: Component cabinets shall be neatly and securely installed plumb. Floor-mounted equipped shall be installed on a concrete housekeeping pad as specified in Section 26 05 01, "Electrical Basic Materials and Methods". Branch circuit connections shall be as shown on the Drawings and the manufacturer's shop drawings.
- D. Low Voltage Control Wiring: All low voltage control wiring shall be installed in a suitable raceway. Low voltage wiring shall be completely tested for continuity and accuracy of connections prior to system power-up.
- E. Line Voltage Wiring: Line voltage wiring shall be installed in a suitable raceway. Prior to connection to dimmers, the contractor shall completely test all line voltage power wiring for continuity and accuracy of connections.
- F. Color Coding: The complete low voltage wiring system shall be color coded according to manufacturer's written instructions and shop drawings and all conductors shall be identified or tagged at terminals.
- G. Testing: Upon completion of the installation and prior to removal of system bypass jumpers, the contractor shall completely test all line voltage power and low voltage control wiring for continuity and accuracy of connections. The jumpers shall remain in place until all loads have been fully tested and found to be free of miswires, short circuits or other wiring defects.
- H. Startup: Upon completion of testing, the system shall be completely checked out by a factory-trained Field Service [Engineer] [Representative] who shall be responsible for initial programming and startup of the system.
- I. Programming: The Field Service [Engineer] [Representative] and the Contractor shall be responsible for initial programming of the lighting control system including, but not limited to setting of all presets, control groupings, time program controls and similar functions, based upon information obtained by interviewing the Owner to determine building operating parameters.
- J. Demonstration: The Field Service [Engineer] [Representative] shall demonstrate the operation of the system to representatives of the Owner and Engineer.
- K. Training: The Field Service [Engineer] [Representative] shall provided a minimum of [16] [4] hours of on-site training for Owner personnel in system operation, maintenance and programming. The system shall be fully operational and approved Operating and Maintenance Manuals shall be available, prior to scheduling of the training session.
- L. Warranty: Provide a full one year parts and labor warranty [and second year service contract on the system]. Warranty coverage shall begin at the time of Project Substantial Completion.
- M. Operating and Maintenance Manuals: Complete instructions, consisting of instructions and maintenance manuals, parts books, system drawings, wiring diagrams and schematics and similar information shall be included as part of the Project Operating and Maintenance Manuals.
- N. Identification: Refer to Section 26 05 53, "Identification for Electrical Systems", for applicable painting, nameplates and labeling requirements.

3.2 INSTALLATION

- A. Contractor shall furnish all equipment, labor, system setup, and other services necessary for the proper installation of the products/system as indicated on the drawings and specified herein. System setup information shall include each dimmer's load type, assigning each dimmer to a control zone (channel), and defining operational control functions desired (i.e. non-dim, constant, dimmable, etcetera).
- B. Install in accordance with manufacturer's handling and installation instructions.
- C. Install in accordance with all local and pertaining codes and regulations.
- D. Utilize an installer with demonstrated experience in projects of similar size and complexity.
- E. Equipment shall be ready to use condition at end of installation.
- F. Energize equipment in accordance with manufacturer's instructions.
- G. Schedule System Commissioning by factory-authorized personnel in accordance with manufacturer's required lead times and written instructions.

3.3 PROTECTION AND CLEANING

- A. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.
- B. Touch up, repair, or replace damaged components before Substantial Completion.
- C. Remove temporary tags, coverings, and construction debris from interior and exterior surfaces of equipment. Remove construction debris from equipment area and dispose of debris.
- D. Clean integral air filters, heatsinks, grills, and fans before Substantial Completion and Commissioning Services.

3.4 MANUFACTURER'S INSTRUCTIONS

- A. Compliance: Comply with manufacturer's product data; including product technical bulletins, product catalog, installation instructions, submittal sketches or drawings, and product carton instructions for installation.

3.5 EXAMINATION

- A. Site Verification of Conditions: Verify that related conditions, including equipment that has been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.
- B. All devices connected to equipment specified in this section shall bear the UL, cUL, or CSA label and comply with all applicable National Electrical Code (NEC) standards.

3.6 PREPARATION

- A. All equipment related to the system shall be factory tested before shipment.
- B. Prepare and provide three (3) sets of Operation and Maintenance Manuals for the equipment provided under this section.
- C. Prepare and provide three (3) sets of final shop drawings for the equipment provided under this section. These drawing sets shall include any changes made during fabrication and installation that differ from the submittal drawings provided earlier.

3.7 WARRANTY

- A. The manufacturer shall provide a single source warranty for all supplied equipment specified in this section to be free of defects in material and workmanship for a period of three (3) years from the date of shipment.
- B. The manufacturer shall repair or replace any supplied product defective in workmanship or materials.

END OF SECTION 26 09 33