C21 ADVANCED TECHNOLOGY DIMMER RACK SPECIFICATION.

GENERAL.

A.) Overview.

    1.) The dimmer racks shall be fully digital, designed specifically for entertainment and architectural lighting, and shall consist of 24 or 48 dimmer module spaces. Dimmer rack systems shall be ETL and cETL marked devices.

    2.) Rack setup and preset data shall, as standard, be fully user programmable on a per rack or system wide basis. The dimmer rack shall report rack status to a remote personal computer or control console and, as an option, report dimmer status information.

B.) Mechanical.

    1.) The dimmer rack shall be a freestanding, dead front switchboard, substantially framed and enclosed with16-gauge formed steel panels. All rack components shall be properly treated, primed and finished in fine texture, scratch resistant, coating.

    2.) The 48 module dimmer rack shall not exceed 80" H x 24.5" W x 23.6" D. Racks shall be designed to allow for adjacent mounting and for bolting to the floor. The 24 module dimmer rack shall not exceed 57"H x 24.5"W x 23.6"D. Rack doors shall not increase the total rack depth by more than 1.0", and will not increase the rack footprint.

    3.) The dimmer rack shall be designed to allow for easy insertion and removal of all modules without the use of tools. Optional dimmer row tie down bars shall be available to mechanically block each row of six dimmer modules into the rack and require the use of a tool. Dimmer supports shall be provided for precise alignment of dimmer modules into power and signal connector blocks.

    4.) Rack spaces shall be mechanically keyed such that modules of greater current capacity cannot be accepted for that space. Racks that allow modules of higher wattage to plug into the same space shall not be acceptable.

    5.) Multiple low-noise fans shall be provided to allow redundancy in case of fan failure. The fans shall maintain the temperature of all components at proper operating levels with dimmers at any load, providing the ambient temperature of the dimmer room does not exceed 95 degrees Fahrenheit (35 degrees Celsius). Air shall flow over the surfaces of the heat generating components using a combination of convection and fan assisted airflow. Each rack shall be outfitted with a lockable door that does not impede airflow in any manner.

    6.) Fans shall be gradually controlled between off and full speed in order to minimize fan noise under all operating conditions. In the event of a rack over temperature condition, a warning shall be displayed on the rack LCD display and remote personal computer (via web browser) and control console (via web browser). If the temperature rises 5 degrees C over the warning threshold, the dimmer rack shall shut down automatically. The system shall also provide low temperature

shutdown below 33 degrees Fahrenheit (1 degrees Celsius) to prevent condensation damage to system electronics.

7.) Load terminations shall be clearly marked with the dimmer rack circuit number. Signal terminations shall be by plug-in screw terminals or insulation displacement to facilitate contracting and servicing and shall be clearly labeled. Rear access shall not be required for rack installation and termination.

8.) Module numbering shall be clearly marked via a numbering strip on the front of the dimmer module tray. Standard number strips shall be available in two channel module configurations. Custom lamacoid number strips may be used on custom installations.

C.) Electrical.

1.) Dimmer racks shall operate at 90 to 264VAC 3-phase, 4 wire + ground or 90 to 264VAC, 1 phase, 2 wire + ground, 47 – 63 Hz at a maximum of 800A per phase. 2400A per phase bussing across adjacent multiple racks shall be possible.

2.) Load circuit wiring terminals for line, neutral, and ground terminals shall accept up to a #6 AWG wire. An optional terminal adapter accepting up to #2 AWG wire shall be available. The fault current protection of the rack shall be 50,000 AIC. Provisions shall be made for optional amp trap devices to provide 100,000 AIC fault current protection if required.

3.) Dimmer racks shall be available with side or bottom power feeds to meet a wide range of installation requirements.

D.) Rack Electronics, Physical.

1.) The main dimmer control electronics shall be housed in a Rack Processor Module (RPM). The dimmer control electronics shall be completely digital without employing any digital to analog demultiplexing schemes or analog ramping circuits.

2.) All rack setup and preset data shall be stored in a non-volatile manner and may be transferred to a replacement Rack Processor Module without losing data.

3.) Each Rack Processor Module shall have a back-lit LCD display with a six key (minimum) keypad for rack setup, preset control, testing, rack status, error and diagnostics. Bi-Color LED's shall indicate "Network Connection", "DMX512 Port A", "DMX512 Port B", "Processor OK", "Module Event", "Panic", "Over temperature" "Phase A", "Phase B", "Phase C", "Active Processor".

4.) An optional backup Rack Processor Module shall provide full redundant tracking processor functions. The Backup RPM shall track all setup, preset and other commands at all times without any operator action. The Backup RPM shall take over all communications and dimming control upon automatic activation.

5.) All rack setup and preset data shall be electronically transferable between the main Rack Processor Module and the backup RPM in case of

the replacement of either of the modules. Rack set up data shall be stored in non-volatile memory.

6.) The Rack Processor Module shall provide signal connections in conjunction with optional power supply units. The RPM shall provide the only point for contractor connection of signal cables and PANIC activation. The contractor connections shall be made with two-part plug in screw terminals (dedicated connector per input) or crimped RJ45 connectors for ease of installation. The RPM shall feature an integrated Ethernet switch to permit the cross connection of up to 4 dimmer racks in a single dimmer room. RPM to RPM Ethernet connections shall be made with pre-made RJ45 patch cables.

7.) All DMX512 & RS485 communication ports and remote contact input connections shall be optically isolated from all processor electronics by a minimum of 2,500V RMS isolation.

8.) The Rack Processor Module shall have the provision to select any of a maximum of 96 dimmer outputs to be activated by the PANIC function. The PANIC function shall be activated or de-activated by one or more local or remote contact closures.

E.) Rack Electronics, Control and Communications.

1.) The control electronics shall provide the following control and communication inputs as standard:

a.) An Ethernet control input. This input can support a connection to a Strand ShowNet system. Each Ethernet control input can generate Reporting messages for the dimmer rack. This input shall also allow for local connection to a personal computer, providing setup, playback, dimming reporting features, and the ability to load rack-operating software.

b.) Two optically isolated DMX512 control inputs. The first input shall accept DMX512 only. The second DMX512 input may be configured to accept DMX512, or Strand Lighting's Vision.net architectural protocol.

c.) Optically isolated contact inputs, for external switching interfaces (24V 100ma). These closures are dedicated for:

1.) PANIC ON Momentary Turns Panic On.

2.) PANIC OFF Momentary Turns Panic Off.

3.) FIRE ALARM Maintained Turns Panic On, no Override.

F.) Rack Electronics, Features.

1.) The rack electronics shall provide two levels of operator interface:

a.) A local standard interface that includes 6 menu keys and a bitmapped backlit LCD display (minimum 16 character x 2 line) to access standard system menus.

b) A networked customizable Web based interface that includes status displays, configuration and maintenance utilities, integrated on-line help system, and alert emails. Support for wireless PDA's shall allow query and control functions.

2.) The dimmer control electronics shall have 16 bit (minimum) fade processing and a dimmer update rate better than 16 ms (60 Hz) or 20 ms (50 Hz). Dimmers set to the same level shall output within +/-.5V of each other, regardless of phase or input voltage, providing the desired level is less than the phase input voltage less the dimmer insertion voltage.

3.) The dimmer output levels shall be regulated for incoming line voltage variations. The regulation shall adjust for both RMS voltage and frequency changes of the incoming AC wave form. Regulation shall maintain the desired output voltage +/- .5V volt for the entire operation range (90 - 264 VAC). The regulation shall compensate for variations of the AC waveform on a dimmer-by-dimmer basis. There shall be no interaction between dimmers in the system or any other equipment. The output shall be regulated to the user programmable maximum voltage level on a dimmer-by dimmer basis. The processor response time to incoming line changes shall take no more than 16 ms (60 Hz) or 20 ms (50 Hz). Dimming systems that do not respond to line voltage and frequency variations shall not be acceptable.

4.) The control electronics shall allow the maximum output levels of individual dimmers to be adjusted, e.g. to compensate for load circuit voltage loss. The selected dimmer curve shall regulate so that the curve is proportional to the programmed maximum voltage.

5.) The RPM shall also have the capability to support dimmers of different types and sizes that may be mixed throughout the rack. Individual dimmers may be dimmed or switched (non-dim). The individual phase control or switching of positive and negative line voltage half cycles shall not be acceptable, as the net resultant DC line current may damage or degrade line supply transformers.

6.) As a standard, dimmer rack status reporting shall report the following conditions/data:

a.) Rack input line voltage per phase.

b.) DMX512 Port A input fail.

c.) DMX512 Port B input fail.

d.) Phase failure (A, B and C).

e.) Rack temperature.

f.) Rack overtemp warning (100 degrees Fahrenheit.) (37 degrees Celsius).

g.) Rack overtemp shutdown (105 degrees Fahrenheit.) (40 degrees Celsius).

h.) Rack under temp shutdown (32 degrees Fahrenheit) (0 degrees Celsius).

7.) IGBT dimmer modules shall be fully status reporting as a standard. Optional Dimmer Reporting Cards (DRC) can be factory installed into a standard SCR dimmer modules. All status reporting dimmers and shall report the following conditions/data:

a.) Dimmer type in slot. (Dimmer dipswitch set at factory).

b.) Load (Wattage) per dimmer.

c.) Deviation from recorded dimmer load.

d.) No dimmer load.

e.) Excess DC on dimmer.

f.) Overload on dimmer.

g.) Power device failure (short circuit or open circuit).

h.) Circuit breaker open.

i.) Dimmer fault.

j.) Change in dimmer type fitted.

k.) RMS Phase current per rack phase.

l.) Dimmer module temperature (w/module shutdown on and over temperature condition.

m.) Forced on at dimmer module.

n.) Dimmer panic.

8.) The control electronics shall provide the following setup functions that shall be user programmable on a per rack or system wide basis:

a.) DMX512 Port A patch.

b.) DMX512 Port B patch.

c.) Architectural controls for Vision.net control systems.

d.) Set rack and circuit ID's (CID).

e.) Dimmer reporting enable/disable. (By dimmer module).

f.) Set dimmer level (%).

g.) Set dimmer maximum voltage (12V - 260V in 1V steps).

h.) Set SCR dimmer maximum voltage (24V - 260V in 1V steps).

i.) Set dimmer minimum level (0 to 99%).

j.) Set dimmer curve.

k.) Set dimmer response time.

l.) Set control input priority logic.

m.) Set status reporting parameters.

n.) Program user curves.

9.) The DMX512 Port A and B patching shall support a rack start address and individual dimmer patch. The architectural patch shall define the rack circuit/room/room channel relationship for Vision.net control systems.

10.) The control electronics shall provide a facility to disable the output of any individual dimmer by setting the level to 0. It shall also be possible to enable and disable dimmer status reporting on a per dimmer basis.

11.) The control electronics shall contain Vision.net user programmable presets, a permanent blackout preset (preset 0) and a user-definable power up preset. It shall be possible to record individual preset crossfade times, including preset 0. The presets shall be user programmable as a snapshot of the current dimmer outputs resulting from all dimmer control sources according to selected control logic, on a per rack or system wide basis. Each preset may have an individual crossfade time between 0 seconds and 60 minutes.

12.) The control electronics shall support a user assignable "control lost" Vision.net preset. Each rack shall, in the event of loss of control signal according to the selected port logic, maintain the last levels for a user programmable period ranging from 0 seconds to 60 minutes. After this time period it shall automatically fade to the "control lost" preset. Alternatively it shall be possible to program the rack to indefinitely hold the last dimmer levels. It shall be possible to continue control without an active control signal using any of the architectural presets. Time resolution to be a minimum of one second.

13.) The processor shall provide an architectural Vision.net control system preset capability of 125 channels for each of 255 separate rooms with programmable fade times. Time resolution to be a minimum of one second.

14.) The system shall provide the ability to set one or a group of dimmers to any level.

15.) The control electronics shall provide the ability to set a library or user programmable 100-point curve (processor to apply a linear interpolation between the user points) to any individual dimmer. Library curves shall be:

a.) Square curve.

b.) S-curve.

c.) Linear power output curve.

16.) User selectable curves shall be:

a.) Non-dim (switched) with a programmable trigger level 0 - 99%.

b.) Electronic ballast fluorescent curve with a kick-start voltage and user programmable top set and bottom cut-off point.

c.) Magnetic ballast fluorescent curve with user programmable top set and bottom cut-off point.

d.) Five user defined programmable curves, programmed with up to 100 steps. The processor is to apply a linear interpolation between the user points.

17.) Each dimmer shall have one of three user programmable response (rack will fade to the new target level in the defined response time) in order to optimize lamp filament life and speed of operation:

a.) Fast (30 ms).

b.) Normal (100 ms).

c) Slow (300 ms).

18.) The system processor shall provide a number of user programmable control logic schemes, regulating the logical relationship between dimmer control sources It shall be possible to set the way in which various control inputs interact with each other to create priorities between all control inputs.

19.) It shall be possible to load new rack operating software via the Ethernet connection to the dimmer rack. There shall be no requirement to turn power to the rack off during the loading of rack software, and in addition the Panic facility and Redundant Tracking Backup (RTB) processors shall be fully operational during software loading to the active processor. It shall be possible to load new rack operating software into the processor, regardless of the state of the program storage.

G.) Dimmer Modules.

1.) The dimmer modules shall be designed using advanced, state-of-the-art components specifically for entertainment lighting. IGBT dimmer modules for 120 volt applications shall be available in dual 20 amp and single 50 amp configurations. SCR Dimmer modules for 120 volt applications shall be available in single 20 amp 3 wire fluorescent, dual 15 amp, dual 20 amp, single 50 amp and single 100 amp configurations. Modules of similar types shall be interchangeable allowing systems with both SCR and IGBT dimmers to be configured freely. Systems that do not permit the mixing of SCR and IGBT dimmers shall not be accepted.

2.) The dimmer modules shall be designed using advanced, state-of-the-art components. The dimmer module shall be capable of "hot patching"

cold, incandescent loads up to its full rated capacity without malfunction with the control signal at full ON.

3.) All single and dual dimmer modules shall be available with optional dimmer status reporting.

4.) The dimmer modules shall be fully plug-in and factory wired. Dimmer modules shall be of rugged and heavy-duty construction enclosed by a formed aluminum chassis. Power and signal pins shall be recessed in a self-aligning housing to avoid handling, storage, and insertion damage. A contoured handle shall be provided for ease of insertion and withdrawal. All chassis parts, except heat sinks, shall be properly treated, primed and finished in fine texture, scratch resistant, coating. Each module shall be labeled with the Philips Strand Lighting logo and rating. Modules constructed of molded plastic for structural support shall not be acceptable. Dimmer modules shall be ETL and cETL listed and CE marked devices.

5.) Dimmer modules shall be keyed so that dimmer modules of greater capacity shall not be interchangeable.

6.) Non-Dim modules shall be available to provide dedicated non-dim circuits not employing SSR devices. Dual modules shall be available providing non-dim/non-dim configurations. Each non-dim shall be provided with a primary circuit breaker of the appropriate rating. Non-dims shall be designed so they can be used for inductive loads.

7.) IGBT dual dimmer modules shall be available with current ratings of 20 amps. IGBT single dimmer modules shall be available with current ratings of 50 amps. Each module shall offer full dimmer status reporting to match all other modules in the C21 Advanced Technology product family. IGBT Dimmer modules shall be fully interchangeable with standard SCR dimmer modules of the same current rating and may be used in systems with standard SCR dimmers. They shall conform to the following specification:

> a.) 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. IGBT Dimmers with insertion loss greater than three volts RMS at full rated load shall not be acceptable.

> b.) IGBT dimmers shall regulate dimmer output to within +/- 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.

> c.) IGBT dimmers shall not use zero cross detection to synchronize to the power line. Dimmer output voltage shall be unaffected by severely distorted or noisy power line waveforms.

> d.) IGBT dimmers 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. IGBT dimmers may also be user set to FPC or RPC modes for LED luminaires.

e.) 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.

f.) Each IGBT 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:

1.) At power-up, each dimmer will detect excessive line voltages. When over-voltage is detected, the dimmer will not turn on its load. Dimmers shall withstand line voltages up to 230 VAC for an indefinite period and up to 280 VAC for fifteen minutes with no damage.

2.) Each dimmer shall detect excessive heat sink operating temperatures and automatically reduce its own "fall time", which minimizes the production of heat.

3.) Each dimmer shall detect load current in excess of its own rating. An overload will cause a dimmer to shut down.

8.) Each dimmer module shall contain circuit breakers, associated solid state switching modules, filters, power and control components.

9.) Standard dimmer electronics shall be completely solid state. They shall utilize two silicon controlled rectifiers in a back-to-back electrical configuration. The full load of the circuit is to be carried and controlled by the silicon controlled rectifiers.

10.) Each 120 volt dimmer shall be protected by a single pole fully magnetic circuit breaker of the appropriate current rating and 10,000 AIC surge rating mounted on the face plate of the dimmer module so that the trip current is not affected by ambient or rack temperature. The circuit breaker shall be rated for tungsten loads having an inrush rating of no less than 20 times normal current and shall disconnect the power to the dimmer module before damage can be done to the dimmer power components. The circuit breakers shall be rated for 100 percent switching duty applications and shall be UL, and cUL marked devices.

H.) Dimmer Module Power Devices.

1.) SSR power devices shall be encapsulated, epoxy filled high impact plastic cases with optically isolated firing circuits, control circuitry, and two silicon controlled rectifiers (SCR's). There shall be a minimum of 2,500 (4,000 in 50Hz systems) volts RMS of isolation between the AC line and the control lines of the SCR. The SCR shall be in an industry standard format that is easily field replaceable without removing any other electrical or electronic devices.

I.) SCR Power Device Filtering.

    1.) Each SCR power device dimmer module shall have an integral inductive filter to reduce the rate of current rise time resulting from the SSR switching on. The filter shall limit objectionable harmonics, reduce lamp filament sing and limit the radio frequency interference on line and load conductors.

    2.) Basic Rise dimmers shall have a rise time of not less than 350 microseconds measured at 90 degrees conduction angle from 10% to 90% of output wave form with dimmer operating at maximum load. Voltage rate of rise (slew rate) must not exceed 420 millivolts per microsecond in any point of the wave under full load conditions.

    3.) Medium rise time dimmers shall have a rise time of not less than 500 (250 at 50Hz) microseconds measured at 90 degrees conduction angle from 10% to 90% of output wave form with dimmer operating at maximum load. Voltage rate of rise (slew rate) must not exceed 300 millivolts per microsecond in any point of the wave under full load conditions.

    4.) Hi-Rise dimmers shall have a rise time of not less than 800 (400 at 50Hz) microseconds measured at 90 degrees conduction angle from 10% to 90% of output wave form with dimmer operating at maximum load. Voltage rate of rise (slew rate) must not exceed 210 millivolts per microsecond in any point of the wave under full load conditions.

    5.) IGBT dimmers shall have a rise time of not less than 1000 microseconds measured at 90 degrees conduction angle from 10% to 90% of output wave form with dimmer operating at maximum load. Voltage rate of rise (slew rate) must not exceed 210 millivolts per microsecond in any point of the wave under full load conditions.

J.) Approved Manufacturer and Products.

    1.) Dimmer racks, modules and control electronics shall be Strand Lighting C21 Advanced Technology dimmer racks.
    2.) Provide 1 – 24 module C21 dimmer rack with control electronics and 24 Dual 2400 watt SCR Dual dimmer modules

A21 DIMMER CABINET SPECIFICATION.

GENERAL.

A.) Overview.

    1.) The dimmer cabinets shall be fully digital, designed specifically for architectural and entertainment lighting applications, and shall consist of 3 or 6 or 9 dimmer module spaces, depending on cabinet size. A secondary "slave" 3, 6 or 9-module expansion cabinet shall also be available. Dimmer systems shall be ETL and cETL listed.

    2.) Cabinet setup and preset data shall, as standard, be fully user programmable on a per cabinet or system wide basis.

B.) Mechanical.

1.) The dimmer cabinet shall be a wall-mount, dead-front switchboard, substantially framed and enclosed with 16-gauge, formed steel panels. All cabinet components shall be properly treated, primed and finished in fine texture, scratch resistant powder coat paint.

2.) The dimensions of the cabinets shall be as follows:

   a.) 3-Module: 6.5 inches deep, 25 inches high and 32 inches wide.

   b.) 6-Module: 6.5 inches deep, 42.5 inches high and 32 inches wide.

   c.) 9-Module: 6.5 inches deep, 62 inches high and 32 inches wide.

   d.) Expansion racks shall be the same size as racks with processors.

3.) The system shall be convection cooled and fans shall not be required. Systems requiring forced air-cooling shall not be acceptable.

4.) Dimmer module over-temperature sensing shall be provided, and the module will shut down until the temperature falls to within acceptable limits.

C.) Installation.

1.) The cabinet shall be factory pre-wired and dressed. The contractor shall provide and terminate all feed, load and control wiring on screw terminals fitted within the cabinet.

2.) Cable entry for all cabinets shall be on the top right side of the cabinet. A removable service panel shall be provided.

3.) All terminations and internal wiring shall be accessible via a removable front cover panel. The Processor Module shall be accessible for programming at all times.

D.) Electrical.

1.) The power efficiency of the dimmer cabinet shall be greater than 95% at full load.

2.) The 3, 6 and 9 module cabinets shall be suitable for 60hz supplies of 120/208VAC Three Phase 4 wire + ground, or 277/480VAC Three Phase 4 wire + ground and shall contain any combination of up to 3, 6 or 9 Power Modules of the appropriate supply voltage. The 6 module cabinet shall also be suitable for 60hz supplies of 120/240VAC Single Phase 3 wire + ground.

3.) Power feed terminals shall accept the following cable sizes:

   a.) Neutral Buss Bar - Main Lug (1) #6 AWG - 350 KCMIL, Load Lugs #14 AWG - #4 AWG.

   b.) Ground Buss Bar - Main Lug (1)) #6 AWG - 350 KCMIL, Load Lugs #14 AWG - #4 AWG.

c.) Main Feed Terminal Block - (1) #6 AWG - 350KCMIL (per phase) 6 & 9-Space racks, (1) #6 - 2/0 AWG 3-Space rack.

d.) Load Wires #24 AWG - #10 AWG.

4.) Each 6 and 9 module dimmer rack shall support an optional Main breaker.

5.) The dimmer cabinet shall have an internal power supply to support up to (16) 24VDC architectural control stations. A supplementary power supply shall also be available.

6.) A "Panic" facility shall turn selected dimmers to full. Dimmers are selected from the rack processor. It shall also be possible to select "Panic" as follows:

a.) Via a remote maintained contact closure for Fire Alarm interface.

b.) Via remote momentary contact closures for "Panic" and "Normal" respectively.

7.) The system may also be configured as a UL924 Emergency lighting system.

8.) The system ground shall be made at a grounding lug in the top of the dimmer cabinet.

9.) All equipment shall be ETL and cETL listed.

E.) Cabinet Electronics, Physical.

1.) The main dimmer control electronics shall be housed in one Rack Processor Module (RPM). The dimmer control electronics shall be completely digital without employing any digital to analog demultiplexing schemes or analog ramping circuits.

2.) All rack setup and preset data shall be stored in a non-volatile manner.

3.) Each Rack Processor Module shall have a back-lit LCD display with a keypad for rack setup, preset control, testing, rack status, error and diagnostics.

4.) LEDs shall indicate "DMX512 Port A", "DMX512 Port B" (ShowNet), Vision.net control and Power.

5.) The Rack Processor Module shall be mounted inside the dimmer rack. The RPM shall provide all necessary low voltage signal connections. The RPM shall provide the only point for contractor connection of signal cables and PANIC activation. The contractor connections shall be made with two-part plug in screw terminals (dedicated connector per input) for ease of installation.

6.) All DMX512 & RS485 communication ports and remote contact input connections shall be optically isolated from all processor electronics by a minimum of 2,500V RMS isolation.

7.) The Rack Processor shall have the provision to select any of a maximum of 96 outputs to be activated by the PANIC function. The PANIC function shall be activated or de-activated by one or more local or remote contact closures.

F.) Rack Electronics, Control And Communications.

1.) The control electronics shall provide the following control and communication inputs as standard:

a.) One optically isolated DMX512 control input.

b.) An RS485 control input for Vision.net architectural control. Vision.net is a control system comprised of architectural style panels for recording and playback of presets in individual assigned "rooms".

c.) There shall be two programmable panic inputs.

d.) One RS232 Serial programming port for remote programming using PC based configuration software.

e.) There shall be an expansion port on the processor termination board to connect the output of the processor to other A21, R21 dimming systems and Contact Relay panels for up to 96 channels of control.

2.) The system shall support an optional ShowNet Ethernet input to provide an additional networked input plus processor status monitoring and configuration.

G.) Rack Electronics, Features.

1.) The rack electronics shall provide two levels of operator interface:

a.) A local interface that includes 6 menu keys and a bitmapped backlit LCD display to access standard system menus.

b.) Remote configuration via personal computer using RS232 or ShowNet Ethernet data links.

2.) Dimmer control electronics shall have 16 bit (minimum) fade processing and a dimmer update rate better than 16 ms (60 Hz). Dimmers set to the same level shall output within +/-.5V of each other, regardless of phase or input voltage, providing the desired level is less than the phase input voltage less the dimmer insertion voltage.

3.) Dimmer output levels shall be regulated for incoming line voltage variations. The regulation shall adjust for both RMS voltage and frequency changes of the incoming AC wave form. Regulation shall maintain the desired output voltage +/- .5V volt for the entire operation range (90 - 277 VAC). The regulation shall compensate for variations of the AC waveform on a dimmer-by-dimmer basis. There shall be no interaction between dimmers in the system or any other equipment. The output shall be regulated to the user programmable maximum voltage

level on a dimmer-by dimmer basis between 24V and 277V for dimmer modules. The processor response time to incoming line changes shall take no more than 16 ms (60 Hz). Dimming systems that do not respond to line voltage and frequency variations shall not be acceptable.

4.) The RPM shall also have the capability to support dimmers of different types and sizes that may be mixed throughout the rack. Individual dimmers may be dimmed or switched (non-dim). The individual phase control or switching of positive and negative line voltage half cycles shall not be acceptable, as the net resultant DC line current may damage or degrade line supply transformers.

5.) As a standard, dimmer rack status reporting shall report the following conditions/data:

 a.) Rack input line voltage per phase (IGBT modules).

 b.) DMX512 Port A input fail.

 c.) Phase failure (A, B and C).

 d.) Dimmer temperature reporting (IGBT modules).

 e.) Report dimmer load and Active Power Management status to a central control computer running Strand Lighting Dimmer.net and Vision.net Designer software (IGBT modules).

6.) The control electronics shall provide the following setup functions that shall be user programmable on a per rack or system wide basis:

 a.) DMX512 Port A patch.

 b.) ShowNet DMX512 patch.

 c.) Architectural patch for Vision.net control systems.

 d.) Record Vision.net preset and preset crossfade time.

 e.) Set dimmer max. voltage (IGBT modules).

 f.) Set dimmer min. level (IGBT modules).

 g.) Set control input priority logic.

 h.) Set Active Power Management maximum current in 1 amp increments (IGBT modules).

7.) The DMX512 Port A and ShowNet patching shall support a rack start address and individual dimmer patch. The architectural patch shall define the rack circuit/room/room channel relationship for Vision.net control systems.

8.) The control electronics shall provide a facility to disable the output of any individual dimmer by setting the level to 0.

9.) The processor shall provide an architectural Vision.net control system preset capability of 8 presets plus full ON and OFF up to the capacity of the dimmer rack and system.

10.) It shall be possible to load new rack operating software via the serial connection to the dimmer rack. There shall be no requirement to turn power to the rack off during the loading of rack software. It shall be possible to load new rack operating software into the processor, regardless of the state of the program storage.

11.) All IGBT dimmers shall support active power management technology that shall allow system designers to securely set limits on circuits to meet watts per square foot requirement on track lighting and other circuits requiring strict power management and to conform with energy management legislation. Once a circuit has a load limit set at commissioning the limit cannot be changed. Load monitoring and status reporting shall be available as a standard feature of Active Power Management allowing a facility to dynamically monitor and adjust lighting loads. The processor shall display the status of any dimmer that has shut down under power management control to indicate to the user that they have overloaded the setting for a specific circuit. This shall be displayed on the local processor and remotely on a suitably equipped personal computer.

A21 POWER MODULE SPECIFICATIONS.

A.) Mechanical.

1.) Power Modules shall be factory wired units of similar size and heavy duty metal construction, designed to be installed into the cabinet as a self contained bolt-in assembly. A plastic Power Module chassis shall not be acceptable.

2.) Modules shall be finished in powder coat black paint.

B.) Electrical.

1.) Power connections shall be made on compression screw terminals. Control signal connections shall be made via plug-in connectors at each module chassis.

2.) Load connections shall be via spring cage terminals.

3.) Power Modules shall be suitable for 120V or 277V, 60Hz.

4.) Each dimmer shall maintain its output RMS voltage within 2% for changes in load from 200 watts to full rated load at any point on the dimming curve.

5.) The power efficiency of each power module shall be better than 97% at full load. Adequate heat sinking shall be provided.

6.) Standard Module electronics shall be completely solid state using two silicon controlled rectifiers (SCR's) per dimmer in inverse parallel configuration.

7.) SCR devices shall be encapsulated in an epoxy filled high impact plastic case with opto isolator, trigger SCR, steering bridge and snubber network. There shall be a minimum of 2500 volts isolation between the ac line and control lines of the SCR sub-assembly.

8.) IGBT dimmer modules shall be available in Quad 1000 watt or dual 2000 watt variants.

9.) Each dimmer shall be protected by thermal magnetic circuit breaker of the appropriate capacity mounted on the faceplate of the cabinet. This protective device shall have a "must trip" rating of 125% of rated capacity and be rated for a minimum 10,000 Amp interrupting capacity.

a.) It shall be possible to use the breaker as a dimmer disconnect device and shall be a UL, cUL listed.

b.) Under overload conditions, the breaker will disconnect power to the dimmer to protect the power device.

c.) The full load current shall be carried and controlled by the SCR or IGBT power device. Dimmers employing Triacs shall not be acceptable.

d.) All Power Modules shall be capable of continuous operation at full rated load. Under no circumstances will modules allowing continued operation with loads substantially in excess of the rated capacity be acceptable.

e.) Each assigned Non-Dim shall have a programmable switching threshold between 1 and 99%.

f.) At full load under normal operating conditions, voltage insertion loss in the dimmer shall be typically 2 volts, but shall not exceed 4 volts.

g.) All dimmers shall have a local control switch to turn the dimmer on for testing and diagnostic purposes.

h.) Dimmer racks shall ship with a dimmer bypass jumper installed on the load terminal blocks. This bypass jumper shall permit loads to be tested and operated from the dimmer rack circuit breakers prior to installation of the system control stations. These jumpers shall be removed at system commissioning. Systems not offering this feature shall not be accepted.

i.) Each dimmer shall have a local test button to permit testing dimmer modules when they are installed without requiring access to system control stations. IGBT dimmer modules shall also feature diagnostic LED indicators for system trouble shooting.

10.) Power Modules shall be ETL and cETL recognized.

C.) Features.

1.) Specific Features of the Incandescent/Inductive Dimmers shall be as follows:

a.) Standard dimmer modules shall be available for operation on 120 or 277 volt power supplies and are offered in Quad 1000,1800 and 2000 watt (120V) and up to 4000 watt (277V) modules. Dual 1800 and 2000 watt (120V) and up to 4000 watt (277V) modules.

b.) SCR Dimmers shall have an integral inductive torroidal filter designed to reduce the rate of rise of current such that the rise time shall not exceed 350µs at full load, measured between 10 – 90% of the load current waveform at a 90° conduction angle.

c.) The dimmer firing circuitry shall produce an output sine wave that is fully symmetrical to minimize the dc component in the output waveform to within +/- 1 volt dc.

d.) It shall be possible to dim low voltage transformer fed loads providing that the transformer used is approved by the manufacturer for use with phase control dimmers.

e.) When dimming cold cathode loads with an Incandescent/Inductive Power Module, a fluorescent dimming curve shall be assigned from the Processor keypad to give a bottom set cut-off ensuring the maximum range of stable performance.

2.) Specific Features of the IGBT dimmer module shall include:

a.) IGBT modules shall be available in dual 2000 watt or quad 1000 watt variants.

b.) Dimmer output waveform shall be available with forward or reverse phase control and effective filtering equivalent to 1000µs.

c.) Each dimmer module shall offer microprocessor controlled over-current and short circuit protection and will automatically shut down in the presence of these conditions. Resetting the dimmer to zero from the control system shall restore operation in the event of a module shutdown.

d.) The dimmer shall control a wide range of loads including dimmable electronic ballasts, LED's, conventional incandescent lamps. Audible noise shall be reduced through the use of electronic phase control and no chokes shall be required. Dimmer efficiency shall exceed 98%.

e.) IGBT dimmer modules shall support Active Power Management technology. Each dimmer will report load status and may have a maximum load set on a per dimmer basis in one amp increments.

3.) Specific features of the Fluorescent Dimmer Modules shall be as follows:

a.) Fluorescent modules are available in dual 120/277 volt power ratings suitable for dimming a wide range of loads.

b.) The fluorescent dimmers shall be suitable for dimming electronic 2 wire or 3 wire ballasts as well as 0-10VDC control ballasts as recommended by the dimming manufacturer.

c.) A mechanical relay shall be provided for switching on the cathode heater supply when the control level is raised above zero on 0-10VDC control modules.

d.) The fluorescent dimmers shall have a "Bottom Set" to adjust the cut-off point ensuring the maximum range of stable performance for both fluorescent and cold cathode loads.

4.) Specific features of the Non-Dim Modules shall be as follows:

a.) Non-dim modules shall be available for 120 and 277 volt applications. Modules shall have 2 or 4 relays rated at 15 or 20 amps.

b.) Non-dims shall allow any circuit to be switched as a non-dim through substitution of a Non-Dim Module for the Dimmer.

c.) Non-dims shall be designed so that they can be used for inductive (transformer-fed) loads. Non-Dims with chokes shall not be acceptable.

D.) Accessories.

1.) A Main breaker shall be available for 6 and 9 module dimmer racks.

2.) To supplement the internal Power Supply, a supplemental Power Supply shall be available to support up to 20 additional architectural control stations, and shall be supplied complete with an enclosure for wall mounting in the dimmer/distribution room. It shall be suitable for 90 - 277 volts AC 60 Hz supplies.

E.) Documentation.

1.) System riser and connection drawings shall be supplied as specified.

2.) Installation Instructions shall be supplied with each A21 Cabinet.

F.) Standards.

1.) The dimmer cabinet assembly shall be ETL and cETL listed.

G.) Environmental Specification.

1.) Ambient temperature extremes: 32 - 104 degrees Fahrenheit (0 - 40 Centigrade).

2.) Relative humidity: 10 - 90% non-condensing

3.) General conditions: Office level cleanliness. Interior use only.

Provide 1- 6 space A21 dimmer cabinet with 0-10v control modules, non-dim modules, constant modules as required.

Provide DMX to VisionNet interface and DMX distribution Opto-isolator as required.

VISION.NET CONTROL SYSTEM SPECFICATION.

SYSTEM OVERVIEW.

A.) System shall be a fully integrated digital lighting control system, utilizing digital communications between stations, and the control devices (dimmers, relays, and DMX-512 controlled equipment) in the system as required.

GENERAL.

A.) Capacities.

    1.) The system shall support up to 255 rooms with a maximum of 125 control channels per room, which can be connected to an unlimited number of dimmers, relays, or DMX512 controlled equipment. The control connection between stations and to dimming and relay systems shall be via standard Cat 5e cable using the Vision.net control protocol. For DMX512 applications an optional Vision.net to DMX512 module shall be available.

    2.) Star wiring shall be supported using any number of available 4 port Vision.net data hubs.

    3.) Large-scale systems consisting of multiple Vision.net networks may be linked using a Strand Lighting ShowNet Ethernet network.

    4.) No central processor shall be required. Systems requiring a separate processor shall not be acceptable.

B.) Interconnection.

    1.) Each station shall be connected as an RS485 serial "daisy chain" using Belden 1583A Cat 5e cable.

    2.) It shall be possible to change standard control stations at any location on the data network without requiring additional wiring or alterations to the wiring specification. Touchscreen stations shall require a separate power feed to operate the station electronics.

C.) Vision.net Configuration Interface.

    1.) The system shall support a digital communications link for station configuration and set up.

    2.) An RS232 programming station shall be used for connecting a Personal Computer operating Vision.net Design software to the Vision.net data network.

VISION.NET DESIGNER CONFIGURATION SOFTWARE.

A.) General.

1.) Designer software shall be a graphical set up and configuration programmed designed to operate under Windows operating systems.

2.) An astronomical clock shall be available on any system touchscreen capable of being programmed to any geographical location in the world. The clock shall be able to execute any number of daily, weekly or date specific events at fixed times, or offset relative to sunset and sunrise.

3.) The system shall support 125 control channels per room with up to 255 rooms per system. Any number of dimmers may be assigned to a room.

4.) Each room shall be capable of having any combination or quantity of control stations.

5.) It shall be possible to change stations at any location by replacing it with a different station type, and modifying the systems configuration file accordingly.

6.) Each room shall have 32 presets available, regardless of the number of rooms or number of channels within each room. Presets shall be selected from control stations, or shall be "played back" automatically by time clock events. Each preset shall have its own programmable fade, delay and hold time and may be linked for sequential playback in a single sequence, or using system macros a continuous loop if required.

7.) Programmable delay, fade and hold times shall be available in the following increments; instant, 1 sec., 2 sec., 3 sec., 5 sec., 7 sec., 10 sec., 15 sec., 30 sec., 1 min., 5 min., 15 min., 60 min.

8.) It shall be possible to allocate a name or label to every room, panel, station, preset and group in the system.

9.) It shall be possible during system configuration to create macros using a "Smart" button. Smart buttons shall carry out a sequence of standard system commands. It shall be possible to program Smart buttons from any control station pushbutton, remote input or, automatically using the astronomical time clock. It shall be possible to assign any of the system commands to any station pushbutton, external device input, time clock event, or Macro step.

10.) In cases where an area is to be divisible for separate or combined control, it shall be possible to combine the constituent rooms either manually or with automatic partition switches. Rooms are combined using a "Room Link" touchscreen button. Rooms that are not linked shall maintain their own presets, levels and channels. "Room Link" coordinates the selection of presets within the combined rooms from any control station within those rooms.

11.). The following commands shall be programmable to any system button:

   a.) Preset.

   b.) Preset/Off.

   c.) Toggle.

d.) Smart.

e.) Raise.

f.) Lower.

g.) Select Map.

12.) The system shall include an output simulation mode allowing the system designer to test all configurations prior to system installation.

13.) Touchscreen configuration shall be supported with simple drag and drop tab, button, slider, sliders, and text entities.

14.) Tabbed touchscreen pages may be created for:

a.) Buttons and Sliders.

b.) Palette Monitor

c.) Web Browser.

d.) Real Time Clock

15.) Touchscreens may optionally be connected to a Strand Lighting ShowNet Ethernet network to connect to Palette series control consoles or Network control devices. In this mode of operation, it shall be possible to view console pages that display information on Cues, Submasters, Macros, Lamp Check and Channels

VISION.NET TOUCHSCREEN STATIONS.

A.) Specific Features.

1.) All Vision.net touchscreens shall be full color displays. Systems that do not support color displays shall not be acceptable.

2.) Users may choose either a 7-inch or a 15-inch full VGA display.

3.) Each display shall support multiple tabs to allow users to organize their displays to meet a wide range of applications. Tabs shall support the following applications:

a.) Programmable Sliders that can be scaled and programmed as both channel controls and submasters. Three fader sizes are available allowing system programmers to optimize the number of faders displayed on screen for maximum flexibility.

b.) Touchscreen buttons shall be available in a variety of sizes and shapes permitting system designers the flexibility to allow buttons to define their function through shape and color.

c.) All displays, faders, buttons and tabs shall have text labels in a choice of fonts, sizes and colors.

d.) Real Time clock display with full system programming.

4.) Systems with network connections shall also support tabs with:

a.) Web Browser capability allowing access to Strand ShowNet network devices.

b.). Remote control and monitoring access to Strand Lighting Palette, Light Palette and Rack Palette control consoles.

c.) Any screen can have a color graphic background to permit a wide range of custom graphic options for system designers. Backgrounds may be any bit-mapped image. Alternately backgrounds may be assigned a wide range of colors.

AV INTERFACE / RELAY DRIVER INTERFACE.

A.) Specific Features.

1.) Each Interface shall accept up to 8 momentary contact closures at their inputs.

2.) In addition to Vision.net data input, the Interfaces shall require an additional 24-volt dc power supply.

PORTABLE ENCLOSURE KITS.

A.) Specific Features.

1.) Portable Enclosure Kits shall enable standard stations to be converted to portable units. Kits shall be supplied complete with 25ft (8m) cable and mating connectors.

DATA CABLE SPECIFICATION.

A.) Specific Features.

1.) Vision.net stations Belden 1583A Cat 5 cable.

2.) DMX512 Belden 9829.

DOCUMENTATION.

A.) Specific Features.

1.) An Operations Manual and Installation Instructions are supplied with each system. Project installation & connection drawings shall be supplied as specified.

ENVIRONMENTAL SPECIFICATION.

A.) Specific Features.

1.) For all control stations and associated equipment, the following recommendations shall apply:

a.) Ambient temperature extremes: 32° - 104° F (0° - 40° C).

b.) Recommended ambient temperature: 64° – 77° F (18° – 25° C).

c.) Relative humidity: 10% - 90% non-condensing.

Provide House lighting controls as shown on the drawings and the below schedule:

Booth, Stage Mgr, ROH Main doors: 12 channel/ 6 preset VisionNet (each location) (qty of 3)

ROH side entry, FOH side entry, Upstage left, Upstage right, Downstage left : 2 button entry station (each location) (qty of 5)

PRESETPALETTE II MEMORY CONSOLE SPECIFICATION.

GENERAL.

A.) General Description.

1.) The lighting control shall be a Strand Lighting presetPalette II lighting console with either 64 sliders and 16 submasters for the 32/64 model or 96 sliders and 32 submasters for the 48/96 model. All controls shall be microprocessor based and specifically designed to provide complete control of stage, studio and entertainment lighting systems.

2.) An open architecture system using non-proprietary interfaces to permit upgradeability shall be used.

3.) All control consoles shall be CE marked, ETL and cETL listed.

4.) The console shall consist of a single enclosure with fully integrated processor. All components within the console housing shall be plug in modules with simple connections to facilitate service support and exchange.

5.) The system shall use a Microsoft operating system to provide a stable graphical user interface.

6.) The lighting control console software shall feature a familiar and easy-to use Windows graphical user interface (GUI) based on the Windows operating system. Software features shall include Off-line Editor, Remote Video, Media Player, Web Browser, and PDF Reader.

7.) The dedicated Windows processor architecture shall deny access to operating system, but shall allow access to an open hard drive for show files. Processor back up shall be supported by the use of any Windows XP, or later, computer running the PC version of the lighting control console software.

8.) The lighting control console shall feature a flexible hardware and software design. Control channel counts, automated lighting support, help files, and additional control hardware shall be easily upgradeable.

9.) Minor revisions of operating software and an off-line editor shall be available to the user via download from the manufacturer's web site

at no additional cost. Console software shall be upgradeable in the field via Internet download.

B.) Capacities.

1.) The console shall provide direct control of up to 1024 DMX512 devices (16,384 via the network) via the channel capacity of the console. This channel capacity starts at 100 channels and shall expand to 3000 channels with channel upgrades as purchased. These upgrades can occur at any time. A channel may control either intensities or intelligent parameters of scrollers and automated luminaries. For maximum flexibility in configuration and future upgradeability console hardware and software shall be available separately.

2.) A show file may contain an unlimited number of cues, groups, submasters, submaster pages, effects, macros and one fully proportional patch that can be stored on an internal hard disk drive and archived to standard USB memory key drives.

3.) Multiple show files and backups shall be stored on the system hard disk.

C.) Control Interface.

1.) The main control shall consist of a numeric keypad, dedicated control keys, context sensitive soft keys, channel control wheel and pointing device for moving light positioning.

2.) Control commands shall be accepted as either command line or direct entry.

3.) One hardware playback, "dipless" crossfade preset masters and time adjustable sliders shall be provided, with a go button and dedicated control keys. Additional unlimited virtual playbacks are available via the graphical user interface. Interaction of the playback shall be user programmable as highest level or latest action takes precedence. The playback shall operate in automatic, manual fade or manual time modes.

4.) The system shall support fully independent cue lists, one of which is directly controlled using the hardware. The remaining cue lists are virtual and can be controlled using the mouse or keyboard. Tracking and Cue Only modes of operation shall be supported.

5.) Each of the 16 or 32 submasters (depending on model) shall be individually programmable as normal, last takes precedence, inhibitive or independent with programmable split up/down fade times, attribute times, and text labels recordable per page.

6.) Advanced functions may be assigned to the submasters, providing firing of macros, cue lists and mastering of DMX512 inputs.

7.) The system shall support two high resolution LCD displays (minimum 1280X1024) for the display of levels, cues, submasters, groups, effects, set-up & patch screens. The displays shall be graphical and support a wide range of user definable screen layouts.

8.) The primary monitor shall be able to support an ELO series touch screen for touch screen functionality. A system that does not support a touch screen shall not be acceptable. Touch functionality includes channel selection, playback functionality, display selection, cue, sub, group and effect editing as well as softkey access.

9.) Attributes shall be excluded from inappropriate masters and shall combine on a latest action takes precedence basis.

10.) An alphanumeric keypad for text labeling shall be provided.

11.) Software and hardware for dimmer reporting, designer's remote, remote video, and Ethernet networking shall be available.

12.) A pointing device shall be provided to access all moving light functionality, including X/Y axis for positioning.

13.) Attributes shall be user selectable and controlled using the soft keys and wheel or the mouse in combination with on screen graphical controls.

14.) Connectivity options shall allow the control console to communicate to Strand's Vision.net architectural control system via RS232. A PaletteOS console can display the PaletteOS software on a Vision.net touch screen. The control console shall connect to an external Windows computer over an Ethernet network in order to facilitate triggering a PowerPoint presentation.

D.) Operating System Overview.

1.) Palette software updates shall be user installable from a USB Key.

2.) Channel and attribute capacity shall be software upgradeable at any time, to the maximum capacity of the console.

E.) System Interface List.

1.) Two Video Outputs (2).

2.) USB connectors (minimum of 2 on back panel, 1 on front panel).

3.) Serial Data port (COM1).

4.) Two DMX512 Dimmer Outputs (2).

5.) Mains Power Input from the external power supply.

6.) Ethernet 10/100/1000 Base-T.

F.) Console Physical & Electrical.

1.) The console controls and electronics shall be a desktop configuration and shall use an Intel microprocessor.

2.) The console shall be constructed of steel with an aluminum face panel. All internal control components shall be fully modular to permit simple removal and exchange. The front panel shall be hinged to permit

easy access. Mouse and keyboard ports shall be provided on the back panel of the console.

3.) The central processor shall be fully integrated into the main console in a separate enclosure for rapid removal and exchange. The processor shall include a 80GB hard disk drive (minimum), standard computer I/O and an integrated USB hub for connection of all console control electronics to the system processor.

G.) Operational Environment.

1.) The acceptable ambient operating temperature shall be 0 degrees to 50 degrees Celsius (32 degrees to 122 degrees Fahrenheit) and the ambient storage temperature shall be -40 degrees to 70 degrees Celsius (-40 degrees to 158 degrees Fahrenheit).

2.) The acceptable operation location shall be the equivalent of a good office environment, without excessive dust.

3.) Acceptable humidity levels for operation shall be 5% - 95%, non-condensing.

H.) Standards Compliance.

1.) The console shall be CE marked and ETL, cETL listed.

PALETTE OPERATING SOFTWARE.

A.) Operating System.

1.) The system software shall be a true 32-bit multi-tasking operating system. Programs using a 16-bit operating system shall not be acceptable. The software shall be user selectable for Tracking style operation or Cue Only style operation. A fully graphical interface shall be standard.

B.) Channel Control.

1.) Selection: Channel control lists shall be composed of any combination of control channels, cues, looks or groups using the +, -, Thru & Thru-on syntax. Any one selection shall be capable of being manipulated for level, color scroller & moving light control without the need to re-select. Mouse selection via the Graphical User Interface shall be available.

2.) Intensity Control: Intensity levels shall be set using the '@' key and inputting a numerical level or adjusted using the level wheel. Context sensitive soft keys with labels available on the system monitor or hard keys shall be provided for Full, DMX512 level, +%, -%, Off, Copy and Move. Level change shall also be available via the wheel mouse provided.

3.) An On key with user definable levels shall be provided.

4.) Commands: Command entry shall be user selectable between command line (RECORD CUE 1 * [ENTER]) and direct entry (CUE 1 RECORD). Consoles that do not provide both methods shall not be acceptable.

C.) Cues.

    1.) The console shall default to tracking cue recording or cue only recording based on operational preference. This shall be set during the initial configuration of the system when the system is started for the first time.

    2.) Each cue may have split fade & delay times, a follow time, link & loop parameters, calls for macros & effects, a text label and may be assigned to any cue or cue list.

    3.) Cue zero shall always be a blackout cue by default.

    4.) Cues shall have up to 26 parts.

D.) Recording & Updating.

    1.) Cues, groups, submasters, palettes, macros, & effects shall be recorded or updated from the keypad.

E.) Playbacks.

    1.) Playbacks shall be provided (one hardware playback and unlimited virtual playbacks), with a Go button, dedicated stop/back, and select keys. Interaction with the playback shall be user programmable as highest level or latest action takes precedence operating from separate cue list. The playback shall operate in automatic, manual fade or manual time modes executing fades while following links, loops and macros.

    2.) The playback faders shall provide rate override of fades.

    3.) Q Only and Tracking modes of operation shall be supported.

F.) Effects.

    1.) Dynamic, fading and tracking FX parameters shall be supported.

    2.) Chase and build effect types shall be supported as shall forward, reverse, bounce and random directions.

    3.) Levels and attributes shall be recorded or shall be randomly generated or inverted or alternatively normal and inverted every cycle.

    4.) Modifications to running effects may be returned back to the effects memory for re-recording.

G.) Cue, Submaster and Effect Previews & Cross Reference Screen.

    1.) Cue and submaster preview modes shall be supported to permit blind changes to be made to these entities using channel control syntax.

    2.) A Cross Reference screen shall provide an alternative view of cues by showing levels recorded in a range of cues.

3.) Changes may be tracked or restricted to one cue using the Cue Only option.

H.) Submasters.

1.) Unlimited pages of fully overlapping submasters shall each be provided each with a fader, virtual fader, bump button and status LED's.

2.) Each submaster shall be individually programmable as normal, last takes precedence, inhibitive or exclusive and text labels recordable per page.

3.) Bump buttons may be individually enabled, disabled, latching or trigger macros.

4.) Submasters shall be loadable with the contents of cues, groups, other submasters or channel lists.

I.) Groups.

1.) Groups may be recorded for fast recall of commonly used stage looks. Groups can be independently recorded or directly recorded from the stage output. Cues recorded using preset focus groups may be easily edited and changed by simply updating the focus groups.

2.) Each group may be assigned a text label.

J.) Display Formats.

1.) User programmable channel display formats shall be provided to show channel levels, colors, and attribute information. User programmable channel formats shall be provided to show channels in show, defined channels or active channels. Screens shall be fully adjustable using the systems fully graphical user interface.

2.) On screen controls shall be provided for programming moving light attributes using the supplied system input device.

K.) Patch.

1.) A proportional soft patch shall be provided.

2.) Dimmers may be profiled, set with a non-dim trigger value, or un-patched at a level.

3.) A library of luminaries to simplify patching shall be provided.

4.) Patch displays shall be ordered by channel or by output.

L.) Profiles.

1.) Profiles may be applied to dimmers or up/down fades in cues or parts.

M.) Set-up.

1.) Simple to use set-up screens shall be provided to configure external communications and operation of the console.

N.) Macros.

1.) Macros may be activated by, submaster's bump button, from a cue, external switch contact, remote control, console power-up or at pre-programmed times.

O.) Archive.

1.) Automated Show archive shall be supported to the systems internal hard disk, a USB key drive, or optional file server. This is configured by the user to occur as often as every 1 minute.

2.) The File control drop down menu shall provide a means to select the current show from the system disk or file server and to copy a show (or any part of a show) to or from a USB key drive, or the file server.

3.) Shows shall have text labels and a time and date stamp.

4.) The system software shall support the loading and saving of database files formatted in the Strand Palette Format (.SPF), data structure and the importing of the Strand Show File (.SSF) data structure. The Strand Show File data structure provides the Palette with backwards compatibility for any 300, 400 or 500 series Strand Lighting control console.

P.) Printing.

1.) The system shall support Portable Document Format (.PDF) printing.

2.) The following printouts may be requested: Patch, Cues, Groups, Subs, Profiles, Macros, Fixtures, Channels in Use, and Channels Not In Use.

PERIPHERALS.

A.) Supported Peripherals.

1.) Support shall be provided for the connection of up to five wireless handheld remote controls or one wired remote.

2.) Additional peripherals, such as remote shall be supported through the integration of additional optional equipment.

SYSTEM SOFTWARE.

A.) Channel Capacity Software Upgrades.

1.) Channel and attribute capacity shall be upgradeable via software to the maximum capacity of the console in 128 or 512 channel increments.

B.) Automated Luminaire Control.

1.) The system shall provide intelligent control of any DMX512 automated luminaire. The console shall display automated luminaire

attributes as true attribute definitions not as channels or DMX512 values. An automated luminaire shall be addressed to a single fixture control channel not a series of consecutive control channels. Consoles that use consecutive control channels or DMX512 percentage values to operate automated fixtures shall not be acceptable.

2.) The Fixture Attributes display shall show fixture number, model, mode, and attribute settings displayed in values of colors, degrees, percentages, hertz, and RPMs, not in DMX512 percentages or channel levels.

3.) All attributes of an automated luminaire (intensity, color, gobo, focus, X-Y position, effects, CMY, RGB, etc.) shall be accessed by typing one channel number.

4.) The system shall use an abstract fixture library for patching and control of automated luminaires.

5.) PaletteOS's abstract control allows for all parameters to be controlled in a user-friendly abstract format. Pan and Tilt shall be adjusted in degrees. Color shall be adjusted using Color Space Control. Gobo parameters like rotation shall be adjusted in RPM speed. Zoom shall be adjusted in degrees. Other parameters shall have similar and consistent parameter control. Console software not using an abstract format shall not be acceptable. Console software only using a partial abstract format shall not be acceptable.

6.) Color Frame Control: Full color frames shall be selected using palettes. Part frames may be adjusted using the rotary control wheels. Preset focus groups shall be available to permit the recall of specific colors from scrollers.

7.) Color Space Control: For control of color mixing units, it shall be possible to use CMY, RGB, HSL or HSV color mixing methods to select colors. An on screen, user selectable, color picker shall be provided. Consoles that do not provide CMY, RGB, HSL and HSV color mixing shall not be acceptable.

8.) Individual attributes shall also be selected from soft keys and the scrolling wheel in conjunction with on screen controls showing attribute names.

9.) Displays shall be provided which show all attributes of a fixture.

10.) Attributes shall be excluded from inappropriate masters and normally operate in latest action takes precedence fashion within submasters, playbacks and effects.

11.) When attributes and levels are recorded in a submaster the levels shall be mastered by the fader but the attributes shall go to their recorded value in a latest takes precedence basis to ensure that scenes played back on submasters can be faded in and out with recorded colors and positions. Attributes shall have the option of moving when the fader is moved off of zero, when the fader reaches full or manually.

12.) Cue tracking shall be supported for attribute channels.

13.) A channel and attribute cross-reference screen shall be provided for blind viewing.

14.) Move In Black shall provide an optional automatic means of moving fixtures to the next required position (pan, tilt, color, gobo, etc.) after the previous fade has completed and when the fixture intensity is zero without the need to record extra cues.

15.) A library of over 900 automated luminaires with text labels shall be provided to facilitate fast patching.

16.) Unlimited preset focus groups shall be provided to simplify the programming of automated luminaires.

C.) Remote Communication.

1.) A programmable RS232 remote cue go output shall be available for triggering external devices. Output format shall be standard ASCII format for interfacing to a wide range of external devices and computers.

2.) The console software shall also support communication with other computer programs running on other computer systems including WYSIWYG and PowerPoint presentation software.

3.) The console software shall support communication with openPalette applications. OpenPalette applications are written as third party applications to communicate with the PaletteOS to provide additional functionality. OpenPalette applications can run from the console or from a networked PC computer.

D.) Ethernet Network Operation.

1.) The system shall support full Ethernet connectivity to system dimmer racks and remote peripherals using the built in Ethernet port on the console. Protocols that shall be available are ShowNet, CKNet, Artnet, Pathport and ANSI E1.31. This is in addition to direct DMX512 connectivity.

2.) The system shall support industry standard 10/100Base-T cables, Ethernet hubs and switches.

E.) Wireless Remotes.

1.) Up to five (5) wireless handheld remote controls may be connected to the system using a Wireless access point.

2.) Multiple access points may be provided to supply adequate coverage throughout a facility.

F.) Tracking Backup.

1.) Two consoles may be configured and operated as main and tracking backup.

G.) Remote Console.

1.) Up to five (5) additional consoles or PCs running Windows XP, or later, shall be able to connect to the Main console as a Remote Console over an Ethernet network.

H.) Remote Video.

1.) Up to five (5) PCs running the PaletteOS shall be able to function as a Remote Video device over an Ethernet network.

I.). Off-Line Editor Software.

1.) A Windows hosted off-line editor shall be available which shall enable show files to be edited and simulated in real time on any Windows XP or later PC.

2.) All facilities of the console, including patching, channel control, playbacks, submasters, effects & set-up shall be supported on the off-line editor.

H.) Showfile Compatibility.

1.) Any showfile that has been created on a PaletteOS based control console shall be able to load, run, edit and function on any PaletteOS based control console. Any console line that limits or truncates features across the console line shall not be acceptable.

J.) VGA Color Video Monitor.

1.) The console shall support computer industry standard VGA color video monitors with a resolution of 1280X1024.

2.) The system shall alternately support an optional ELO series touch screen.

K.) Included Furnishings.

1.) The control console shall be supplied with:

a.) Power cord.

b.) A high quality dust cover.

c.) An USB Key for archive storage.

d.) An ASCII standard computer keyboard

e.) A standard computer mouse.

Provide:
1 – Preset Palette 2 48/96 with 1000 channels complete with 19" flat screen monitor, keyboard, mouse, UPS, 25' DMX cable, dust covers, all required cables, and software.

3 – DMX wall mount input jacks in the booth, on stage right, and rear of house as shown on drawings

CONNECTOR STRIP SPECIFICATION.

General.

A.) General Description.

    1.) PCS Series Connector Strips shall consist of an extruded aluminum raceway and cover with a minimum wall thickness of not less than .125 inches and a minimum cross section of not less than 5 inches high x 4 inches deep. Unless otherwise specified, raceway and cover shall be furnished in a low gloss black finish. Raceway and cover shall be inherently rustproof.

    2.) Connector strip raceway shall have provisions for an integral internal low voltage barrier.

    3.) Internal wiring shall be of a minimum 125 degree Celsius cross-link polyester in gauges as required by amperage of specified connectors and receptacles.

    4.) Internal wiring shall terminate to molded barrier terminal blocks of proper amperage, size and capacity. Terminal blocks shall be clearly marked and identified for incoming field wiring.

    5.) External connector strip circuit identification shall consist of minimum 2 inch high die cut vinyl characters in the color(s) specified herein or as shown on drawings.

    6.) Lengths and circuitry of each connector strip shall be as specified herein or as shown on drawings.

    7.) Connector strips shall be furnished with mounting brackets and hardware in the type as specified herein or as shown on drawings. One (1) mounting bracket for every five (5) feet of raceway will be provided. Unless otherwise specified, mounting brackets shall be furnished in a low gloss black finish.

    8.) Connector strips shall be UL listed and labeled for use in the United States and in Canada and marked suitable for damp locations.

Provide connector strips per the following schedule:
All connectors and labels on the upstage side of the connector strip.
All terminal boxes on stage right
All strips shall have 60' of Multi-cable, 60' flexible DMX cable, correctly sized and configured Gridiron junction boxes and strain relief.
All strips shall have the correct quantity of single pipe hangers.
All connector strips are 30' long
All connector strip outlets shall be flush mounted:
    GSP outlets for the dimmed circuits,
    Edison duplex outlets for the constant circuits,
    5-pin XLR for the DMX outlets

1st electric: 10 GSP dimmed outlets wired on 10 circuits evenly spaced.
        1 DMX out on Stage right side of the strip
        1 Edison duplex out next to the DMX jack

2nd electric: 12 GSP dimmed outlets wired on 6 circuits spaced for portable
               borderlights.
                 1 DMX out on Stage right side of the strip
                 1 Edison duplex outlet located next to the DMX jack

3rd electric: 12 GSP dimmed outlets wired on 6 circuits spaced for portable
               borderlights.
                 1 DMX out on Stage right side of the strip
                 1 Edison duplex outlet located next to the DMX jack

4th electric: 12 GSP dimmed outlets wired on 6 circuits spaced for portable
               borderlights.
                 1 DMX out on Stage right side of the strip
                 1 Edison duplex outlet located next to the DMX jack

5th electric: 6 GSP dimmed outlets wired on 6 circuits evenly spaced.
                 1 DMX out on Stage right side of the strip
                 4 Edison duplex outlets, evenly spaced, wired on 1 circuit.

FLOOR POCKET SPECIFICATION.

GENERAL.

A.) Overview.

    1.) PFB Series Flush Floor Pocket Outlet Box shall consist of a 16 gauge cold rolled steel back-box and receptacle plate, a 3/8 inch thick cast iron hinged cover floor plate with non skid tread, and four (4) cable slots unless otherwise specified. Back-box, receptacle plate, and floor plate will be furnished in a low gloss black finish.

    2.) Floor pocket outlet box shall have provisions for an integral internal low voltage barrier.

    3.) Circuit identification shall consist of minimum 3/4 inch high die cut vinyl characters in the color(s) specified herein or as shown on drawings.

    4.) Circuitry of each floor pocket outlet box shall be as specified herein or as shown on drawings.

    5.) Floor pocket outlet box shall be UL listed and labeled for use in the United States and in Canada and marked suitable for damp locations.

    Provide per the following:

    6 – Custom insert plate with 1 flush mount Edison outlet. Contractor shall remove existing insert plates and ship them to the distribution supplier. Do not remove the existing floor pockets. Manufacturer will fabricate new insert plates to be installed in the existing floor pockets.

SURFACE/FLUSH MOUNT OUTLET BOX SPECIFICATION.

General.

A.) General Description.

   1.) Surface/Flush Mount Outlet Boxes shall consist of an extruded
   aluminum enclosure and cover with a minimum wall thickness of not less
   than .125 inches and a minimum cross section of not less than 5 inches
   high x 4 inches deep. Unless otherwise specified, enclosure and cover
   shall be furnished in a low gloss black finish.   Enclosure and
   cover shall be inherently rustproof.

   2.) Enclosure shall have provisions for an integral internal low
voltage barrier.

   3.) Internal wiring shall be of a minimum 125 degree Celsius cross-link
   polyester in gauges as required by amperage of specified connectors and
   receptacles.

   4.) Internal wiring shall terminate to molded barrier terminal blocks
   of proper amperage, size and capacity. Terminal blocks shall be
   clearly marked and identified for incoming field wiring.

   5.) External circuit identification shall consist of minimum 1 inch
   high die cut vinyl characters in the color(s) specified herein or as
   shown on drawings.

   6.) Enclosure length and circuitry of each outlet box shall be as as
   shown on drawings.

   7.) Surface mount inlet/outlet box shall be UL listed and labeled for
   use in the United States and in Canada and marked suitable for damp
   locations.

   Provide 8 – surface mount GSP single circuit outlet boxes for FOH cove.
   Each outlet box shall have 2 GSP outlets wired to the same circuit.
   Contractor shall provide and install new fixture mounting hardware to
   support new fixtures.

   Provide 1 – surface mount DMX outlet box to be installed in the FOH
   cove.

LEKO LITE SERIES ELLIPSOIDAL SPOTLIGHT – 5 DEGREE TO 50 DEGREE SPECIFICATION.

GENERAL.

A.) Overview.

   1.) The LEKO LITE Series shall be an ellipsoidal reflector spotlight,
   available in 5, 10, 19, 26, 36 and 50 degree beam angles.

   2.) The luminaire shall have a precision optical system designed around
   a Dichroic reflector in combination with a high efficiency lamp and
   shall feature a Teflon-smooth lens adjustment. The Dichroic glass
   reflector shall provide both high light output and cool beam operation

for extended pattern and color life. The luminaire shall also have a lamp centering/field adjustment mechanism and a bayonet action lamp changing system that simplifies lamp changes by maintaining field adjustments. Peak/Flat field adjustment shall be via screw drive mechanism to insure smooth, tool free field settings.

3.) The luminaire shall be ETL cETL and CE marked.

B.) Mechanical.

1.) Adequate ventilation shall be provided in the form of openings in the body with proper baffling to prevent light leaks. Further reduction of the temperature shall be accomplished through the use of a heat sink around the lamp receptacle.

2.) The lamp, reflector, shutters and template slot shall be mounted within a die-cast aluminum housing.

3.) The lenses for the 19 - 50 degree shall be mounted in interchangeable die cast lens tubes and the 5 and 10 mounted in interchangeable metal spun tubes, designed to provide for sharp or soft definition of the beam without allowing the passage of stray light rays or extraneous internal reflections from the lens tube.

4.) The lens tubes between 5 to 50 degree luminaries shall be interchangeable.

5.) This tube shall be fitted with heavy-duty color frame holders capable of holding two standard metal color frames.

6.) The Housing shall rotate 360 degrees to provide optimum luminaire orientation at all times. Luminaries offering limited range of motion shall not be accepted.

7.) The shutters shall be stainless steel. The shutters shall operate in three independent planes. It shall be possible to align any two adjacent shutters parallel to one another. The three-plane gate assembly shall make triangular patterns possible. Shutters shall be held in a spring loaded gate assembly.

8.) Pattern and gobo size shall be B.

9.) Exterior finish shall be black epoxy powder coat.

10.) Overall length of the unit shall not exceed:

    a.) 5 degree: 41 inches (1035mm) plus 3 inches (70mm) for lens focus.

    b.) 10 degree: 26 inches (665mm) plus 3 inches (70mm) for lens focus.

    c.) 19 - 50 degree: 20 inches (507mm) plus 3 inches (70mm) for lens focus.

11.) Weight shall not exceed:

a.) 5 degree: 23.5lbs (10.7kgs).

                b.) 10 degree: 19.7lbs (8.9kgs).

                c.) 19 - 50 degree: 18.9lbs (8.6kgs).

C.) Electrical.

        1.) Supply Voltage shall be 120 to 240V, 50/60Hz.

        2.) Max Lamp Watts shall be 750W at 115v and 800w at 230/240v.

        3.) Lamp Type/Socket shall be Philips FastFit.

        4.) The luminaire shall be ETL and cETL Listed and CE marked.

D.) Environmental.

        1.) Maximum operating ambient temperature shall be 115 degrees
        Fahrenheit (47 degrees Centigrade). Maximum surface temperature shall
        not exceed 440 degrees Fahrenheit (227 degrees Centigrade).

        2.) Recommended tilt angles of use shall be +90 degrees to -90 degrees.

E.) Optical Train.

        1.) The luminaire shall have a FastFit socket to accommodate, an
        axially mounted tungsten-halogen lamp, a dichroic glass cool beam
        reflector, four push shutters and a template slot, all mounted within a
        rotating die-cast aluminum housing.

        2.) The luminaries shall have the following lenses.

                a.) 5 degree: 13.8 inch (350mm) acrylic micro fresnel lens.

                b.) 10 degree: 9.8 inch (250mm) acrylic micro fresnel lens.

                c.) 19 & 26 degree: 4.7 inch (120mm) ground and polished crown
                glass aspheric lens.

                d.) 26 & 50 degree: 3.9 inch (100mm) ground and polished crown
                glass aspheric lens.

        3.) The rear housing assembly shall open for reflector cleaning.

        4.) Lamp centering shall be accomplished with the use of a screwdriver.

        5.) Focusing shall be accomplished by moving the burner assembly using
        a simple screw drive mechanism for smooth operation. These actions
        shall be separate, self-locking and non-interactive.

        6.) Lamps shall be removable from the unit without tools for simple
        lamp replacement

        7.) Removal and replacement of a lamp shall not change the lamp focus
        or alignment.

F.) Included Furnishings.

    1.) Mounting yoke.

    2.) Color frame.

    3.) C-clamp.

    4.) 3 foot (0.9m) power cable with bare leads or connector specified.

Provide 8 – 19 degree LEKO ellipsoidal fixtures complete with color frame, C-clamp, safety cable, 575 watt fast fit lamp, and factory installed GSP connector.
Provide 8 spare lamps
STRAND SELECON RAMA 6 INCH FRESNEL SPECIFICATION

GENERAL.

A.) Overview.

    1.) The Fresnel fixture shall be purpose designed for performance lighting applications.

    2.) The Fresnel fixture with integrated safety cable shall be supplied with a hard-tooled color frame and a short form instruction manual for immediate use. A detailed instruction manual shall be available for download from the manufacturer's website.

    3.) The Fresnel fixture shall comply with ETL and cETL standards and listed to U.L. standard 1573.

    4.) The Fresnel fixture shall be able to be operated to a maximum power input voltage of 120V.

    5.) The Fresnel fixture shall be able to use up to a 1000W lamp.

    6.) The Fresnel fixture shall be supplied with a P28 lamp socket.

    7.) The Fresnel fixture shall be supplied with a 4-foot long temperature resistant silicon rubber cable. There shall be three conductors of a 1.5mm diameter within. The power supply cable point of entry to the Fresnel fixture shall be a trumpet gland constructed from high temperature resistant engineering plastic. There shall be no direct clamping pressure on the cable, and a separate IEC plug and connector shall not be acceptable. The power supply cable shall be retained by two separate indirect pressure points located within the cable connector compartment.

    8.) The Fresnel fixture shall not exceed 14 lbs 5 oz in weight including the barndoor accessory and the color frame.

    9.) The Fresnel fixture shall have the following dimensions:

        a.) Height: 15 15/16 inches.

        b.) Width: 11 7/16 inches.

c.) Length: 14 9/16 inches.

10.) The lamp house of the Fresnel fixture shall have rounded corners and edges with no sharp edges. It shall be constructed from aluminum and engineering plastics.

11.) The sides of the Fresnel fixture shall be constructed from extruded aluminum for strength, lower weight and no noise during the expansion and contraction period when the Fresnel fixture is heating up. Sides constructed from sheet metal shall not be accepted. Ventilation of the Fresnel fixture shall be maximized by not less than five convection slots running the entire length of the lamp house.

12.) The front and rear of the Fresnel fixture shall be constructed from high temperature and impact resistant engineering plastic moldings for strength, lower weight and no noise during the expansion and contraction period when the Fresnel fixture is heating up. Front and rear castings constructed of metal shall not be accepted.

13.) There shall be a rear grab handle mounted on the rear of the Fresnel fixture. The grab handle shall be constructed from high heat and impact resistant engineering plastic, and shall have a warning label formed as an integral part of the handle.

14.) There shall be a cable connector compartment located on the outside back molding of the Fresnel fixture. The power supply cable shall be terminated in this compartment and not in the main body of the fixture.

15.) For ease of service it shall be possible to gain access to the interior of the cable connector compartment by the removal of three screws and the cable connector compartment cover.

16.) The paint finish of the Fresnel fixture shall be low reflective, matt charcoal color, electrostatically applied, baked on epoxy powder coat. The finish of all exterior plastic components shall be matt charcoal color.

17.) The Fresnel lens shall be 6" in diameter, mounted inside the fixture and fully supported around its entire circumference. Stainless steel springs shall hold the lens in position and allow for movement caused by heat expansion.

18.) The Fresnel fixture shall have a spherical reflector, manufactured from 99.99% super pure aluminum anodized and polished to provide a pure specular reflector.

19.) The lens and reflector shall be quickly accessed for cleaning without tools in the lamp housing by means of a side hinged bottom tray held closed with a spring clip assembly. It shall possible to clean the lens and reflector of the Fresnel fixture without altering the set focus position.

20.) The Fresnel fixture shall comply with the following performance specifications when using a BTR 1000W 120V 27,500 lumens lamp:

a.) Beam Angle: (2:1 variation from centre peak) 7-50 Degrees.

b.) Minimum Light Output: 7 Degrees - 165,600 Candela, 50
                Degrees 17,640 Candela.

B.) Operation.

        1.) The Fresnel fixture shall be panned by loosening the yoke nut and
        bolt, twisting the yoke to the desired position, and tightening the
        yoke nut and bolt.

        2.) The Fresnel fixture shall incorporate a locking clamp disc and knob
        for tilt operation. The operator shall be able to loosen the tilt-
        locking knob, tilt the Fresnel fixture and then lock the Fresnel
        fixture in place.

        3.) The focus fastening system shall be by a simple heat resistant low
        maintenance screw knob. A focus reference scale to record the focus
        position is to be provided.

        4.) The Fresnel fixture shall have reference scales on the axis of
        movement to comply with stage lighting visualization software packages.
        Tilt reference scale with degrees marked in increments from the centre
        line of the fixture. Focus reference scale with the beam angle degree
        marked in increments from 7 to 50 degrees.

        5.) It shall be possible to access the lamp of the Fresnel fixture
        without the need of tools and without altering the focus position of
        the fixture or the barndoor accessory. Lamp access that alters the
        focus position of the fixture or the barndoor accessory shall not be
        accepted.

        6.) The lamp access shall be by means of a side hinged bottom tray held
        closed with a spring clip assembly. The hinge design shall be
        incorporated in the shape of the lamp house side extrusion, and shall
        run the length on the lamp house for strength and rigidity.

        7.) The mains power shall be automatically disconnected when the lamp
        access tray is opened.

        8.) The Fresnel fixture shall incorporate an integral safety cable that
        shall be able to be retracted into the fixture when not in use. The
        safety cable shall be rated for the weight of the fixture.

        9.) It shall be possible to adjust the balance of the Fresnel fixture
        by repositioning the yoke as required along the length of the fixture.
        There shall be a balance point marked on the focus reference scale.

        10.) The Fresnel fixture shall have three accessory slots for
        positioning of a safety mesh, color frame and barndoor accessory. The
        accessories shall be retained in the Fresnel fixture with an accessory
        slot cover. A spring retention clip shall not be accepted.

Provide 10 – 6" RAMA Fresnels complete with color frame, C-clamp, safety
cable, 750 watt BTN lamp, and factory installed GSP connector.
Provide 10 spare lamps

BORDERLIGHT

Specifications:

The R40 Borderlight shall be a compartmented multi-circuit striplighting device constructed of 20-gauge steel. Each unit shall be supplied with porcelain medium screw-base sockets spaced on 6" centers and wired sequentially in three or four circuits. Each compartment shall contain a lampholder, louvers for heat dissipation, a baffle to minimize light leak and a color filter slot. Integral to the selected length of the luminaire shall be a spring-loaded color filter frame retaining door or doors.

Relamping shall be accomplished by raising the spring-loaded color filter frame retaining door, removing the color filter frame and unscrewing the lamp from the lampholder.

The portable luminaire shall be supplied complete with reversible color frames for glass or sheet color filters, one per socket, a three foot three wire Teflon lead in black fiberglass sheathing, one pair per circuit, and threaded, locking handles for tilt adjustment. Exterior finish shall be baked black enamel.

The continuous length luminaire shall be as above but shall have deleted the three foot three wire Teflon lead and the adjustable strap iron swivel hangers. The continuous length unit shall be provided with a wiring compartment for contractor connection of permanent circuitry, sized to accommodate the number of circuits required. Luminaire shall be provided with chain mounting supports.

Light output of the luminaire shall be a function of lamp selected, see lamp substitution data.

The luminaire shall be U.L. &c.U.L. Listed and labeled for use with up to a 300-watt lamp. Luminaire shall have a New York City Calendar Number.

Provide 9 - 7.5 foot R40 3 circuit borderlights complete with color frames, C-clamps, trundles, safety cables, 135 - 90 watt Par 38SP lamps, and factory installed male and female GSP connectors. 50 each of red, green, blue roundels.
Provide 20 spare lamps

PLCYC1 LED CYC LIGHT SPECIFICATION.

A.) Overview.

   1.)   The luminaire shall be a full spectrum color mixing luminaire employing a red, green, blue, and white LED engine. The engine shall

be capable of providing tunable white color temperature matched presets as well as millions of permutations of color.

2.)   The luminaire shall employ One (1) LED light source engines that will not emit light in the ultra-violet (wavelengths less than 400nm for UV-A,B, or C) or the Infrared spectrum (wavelengths of more than 775 nm). Units that emit light within this spectrum shall not be accepted.

3.)   The luminaire shall employ a 60 degree holographic diffuser with an output of 2,000 lumens in its warm white setting.

4.)   The luminaire shall have an integrated control system that provides local controls offering access to set up parameters, preset color temperatures, stored custom presets, and status reporting.

5.)   The luminaire shall have control inputs for:

   a. DMX512 with input/output connectivity
   b. Wireless DMX512 (optional) requires additional hardware.

B.) Physical

1.) PLCYC Led Shall not exceed 10.9 inches [277.4mm] (at it longest dimension) when
the luminaire is at a 90 degree angle (at a 90 degree angle to the yoke) or 14.2 inches [360.68mm] when the unit is set at a 0 degree focus angle (pointing straight down).

2.) The optical system shall consist of specifically tuned holographic diffusers in conjunction with a coated asymmetric reflector system.

3.) The Luminaire shall allow for floor or pipe mounting with use of an appropriate approved hanging devices such as a C-Clamp or Half Coupler. Floor mounting shall be achieved with out any external trunions or floor mounts. The PLCYC floor mount consists of its yoke and body rotated to form a floor stand.

6.) The construction of the unit shall be a machined aluminum, sheet metal and molded engineering grade plastic.

7.) Weight shall not exceed 7.3 lbs. [3.3 kg] luminaire only.

C.) Electrical.

1.)   Luminaire shall be available with PowerCon in and through connectors allowing the
daisy chaining of power from luminaire to luminaire.

2.)   Supply Voltage shall be 120 to 240V, 50/60Hz. (+/- 10% auto-ranging)

3.)   The luminaires current draw shall not exceed 1.91 amps (120V) or 0.95 amps (240V) luminaires that do not meet these criteria shall not be accepted.

4.)   The light engine source shall be one (1) RGBW 120 Watt LED chip.

5.)   The luminaire shall be ETL and cETL Listed and CE marked.

D.) Environmental.

   1.)   Maximum operating ambient temperature shall not exceed 122
       degrees Fahrenheit (50 degrees Celsius).

   2.)   A variable speed cooling system shall be employed to maintain the
       optimal operating temperature of the luminaire.

   3.)   Luminaires shall be low maintenance and environmentally friendly,
       all units shall be mercury free.

E.) Operation.

   1.) The luminaire shall have control inputs for:
            a. DMX512 with input/output
            b. Wireless DMX512 (optional)

       Luminaires utilizing proprietary only controls shall not be
       accepted.

   2.)   DMX512 control will be via either 3 Channel, 8 or 16 bit control;
       control parameters for each DMX512 output shall be as follows:

            a. 8 Bit Mode (3 Channel)
                        1. Intensity
                        2. Preset Color Selection
                        3. Timing

            b. 8 Bit Mode (9 Channel)
                        1. Intensity
                        2. Red
                        3. Green
                        4. Blue
                        5. White
                        6. Preset Color Selection
                        7. *For Future Use*
                        8. Timing
                        9. Control

            c. 16 Bit Mode (15 Channel)
                        1. Intensity - High
                        2. Intensity - Low
                        3. Red - High
                        4. Red - Low
                        5. Green - High
                        6. Green - Low
                        7. Blue - High
                        8. Blue - Low
                        9. White - High
                        10.   White - Low
                        11.   Preset Color Selection
                        12.   *For Future Use*
                        13.   Intensity time

14.   Color time
                        15.   Control

3.)   The luminaire shall an onboard display and controls of the
      following:

      a. Menu settings:
              i.   Save a Preset
              ii. Edit a Preset
              iii. Color mix
              iv. Fan Control
              v.   Settings
              vi. Lock Fixture
              vii. Enter Password
              viii.   LED Status

      b. Security and Password settings:
              i.   Security Settings
              ii. Power Up Modes
              iii. IR Enabled/Disable
              iv. Software updates
              v.   DMX512 Enabled

4.)   Security settings shall be employed on a four (4) level access.
      Each level shall allow the end user additional features and
      settings. Power limit settings, power up presets, hour reset, and
      password settings may be set under full access control. Security
      settings shall follow a four level access and noted as the
      following:
              a.)   Level 0 system is locked, Menu/Esc. Key is active
              b.)   Level 1 All keys are active setting of DMX512, Preset
                    select, intensity
              c.)   Level 2 Editing and Saving Presets added to Level 1
                    functionality
              d.)   Level 3 All settings available on the settings screen

 Units not utilizing this type of technology or any security settings
 shall not be accepted.

5.)   The LED technology employed in the luminaire shall be that of a
      light gathering and pre-combination technology from a smaller number
      of emitters. The LED shall comprise Red, Blue, Green, and White
      sources and combined via a light gathering system and then mixed
      using a TIR device to form a single output beam of uniform color.

6.)   Access to on board presets shall be accessible from the control
      panel of the luminaire. Each user definable preset shall store
      color temperature, RGBW, and intensity settings for each of the
      thirty-one (31) presets. Presets shall be stored in the fixture
      firmware are defined as follows:

      a. Preset 1 (Scratch Pad) user definable preset
      b. Preset 2 (Warm White) factory preset
      c. Preset 3 (Cool White) factory preset
      d. Preset 4 (Daylight) factory preset
      e. Preset 5-31 user definable presets

7.)   The luminaire shall provide power monitoring and hour logging technology. This technology employs provides:

   a. Hours in Use
   b. Power consumption
   c. Operating temperature

This technology shall be utilized for information concerning the power consumption of the luminaire, and "on" time for the luminaire. The logging timer may be reset under secure password settings. Luminaires not utilizing hour logging technology and luminaire status will not be accepted.

Provide 7 – PLCYC fixtures complete with, C-clamps, floor or Pipe mount yoke, safety cables, and Power con cables with factory installed GSP connectors.
Provide 7 – 2.5M Powercon to powercon jumpers.
Provide 7 – 10' 5-pin DMX extension cables.