

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 UL and cUL 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 33 inches wide.
 - b.) 6-Module: 6.5 inches deep, 42.5 inches high and 33 inches wide.
 - c.) 9-Module: 6.5 inches deep, 62 inches high and 33 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) #4 AWG - 300KCMIL (per phase)

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 UL and cUL 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 +/-0.5V 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 +/-0.5V 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 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 (IGBT Modules).
- b.) DMX512 Port A input fail.
- c.) Phase failure (A, B and C).
- d.) Dimmer temperature reporting (IGBT modules).

7.) 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 (12V - 277V in 1V steps).
- f.) Set dimmer min. level (0 to 99%).
- g.) Set control input priority logic.

8.) 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/channel relationship for Vision.net control systems.

9.) 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.

10.) 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.

11.) 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.

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 compression screw terminals on a terminal block.
- 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.) The maximum output voltage level for each individual dimmer shall be programmable from the keypad to any desired point with automatic re-calculation of the assigned dimmer curve across the permitted voltage range.

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

i.) 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.

j.) 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 UL and cUL 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 800µs.

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%.

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 and a Programming Guide shall be supplied with each A21 Cabinet.

F.) Standards.

1.) The dimmer cabinet assembly shall be UL and cUL 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.