
MedLux® XLS MRI Compatible Dimmer Controller

Why do I need a special dimmer?

Providing dimming within an MRI shield room has historically been a difficult challenge. Traditional wall dimmers cannot be used because their “Triac Phase-Cut” operation creates interference due to rapidly switching the load current ON and OFF. The only viable technique was to use incandescent bulbs driven by DC current. A relatively expensive controller was then used to vary the DC voltage level and thus provide a dimming function. However, with the advent of high brightness LED technology, a new dimming option is available.

MedLux® Dimming System Description

The MedLux XLS dimmer system is designed to operate exclusively with MedLux LED lamps and illuminators. The unique control method used does not modify or condition the incoming AC power to the lamps, but rather, provides brightness information via a separate Class 2 wiring arrangement to each lamp. The dimmer module itself is a small electronics package that mounts in a standard single gang wall box. A graphic wall plate covers the box opening and provides all operator controls via membrane touch switches. This allows for easy cleaning and long life.

The dimmer module receives power from a small Class 2 wall adapter, usually located in the equipment room. The interconnecting cables use familiar ‘RJ-45 Data Network’ style connectors that are easy to attach. A ‘home-run’ cable brings the power and control signals to and from the dimmer module. If the dimmer is installed inside the MRI suite, this cable will run directly to the nearest lamp to be controlled. From there, patch cords are plugged-in to ‘daisy-chain’ from that first lamp to each successive lamp to be controlled. If the dimmer is to be installed inside the control room, then a twisted-pair cable is routed to a signal filter in the equipment room to allow a noise-free connection into the MRI suite. From there, a home-run cable is again routed to the nearest controlled lamp, and so on. Note that any lamp not connected to the ‘daisy-chain’ will remain at full brightness as long as main’s power is applied. It is also important to note that some of the latest magnet technologies, particularly open bore designs, are much more sensitive to noise sources. In these cases, it is not advisable to locate the dimmer inside the scan room. Some vendors prohibit this in all cases, so please check with the magnet manufacturer’s specifications/recommendations.

Dimming is accomplished by a technique known as Pulse Width Modulation, or PWM for short. Unlike standard incandescent or fluorescent lamps, the MedLux LED lamps and illuminators can turn ON and OFF very rapidly. They can change so quickly that the human eye cannot perceive anything happening (no flickering). By changing the amount of time the lamp is ON vs. OFF, the eye will average the result. The effect is smooth brightness levels from zero to maximum. The LED drive electronics is specially designed to accept a low voltage PWM signal to accomplish the dimming effect. The dimmer has sufficient drive capability to control up to 30 lamps.

One special feature of the MedLux dimmer is compatibility with sensitive MRI equipment. A PWM control signal generally has the shape of a ‘square wave’, that is, when it switches from OFF to ON and back again, the transitions are very fast. These fast edges can cause excessive amounts of electrical interference. The MedLux dimmer circuits are designed to produce a ‘trapezoidal’ output shape. The transitions are made to change slowly, thereby eliminating nearly all of the electrical interference.

Third Party Controls

MedLux® lighting fixtures can be controlled by third party lighting controllers that use the 0-10V analog dimming protocol. A special module, called the XLIM, provides the interface required between this well-known protocol and our proprietary dimming system. Since many control systems limit the dimming range such that minimum dim levels are not OFF, some sort of relay is often required. That is also true when interfacing with MedLux® products. Simply feed the relay output to the facility filter that provides the power to the fixtures. If multiple zones are required, a separate facility filter will be needed for each zone.

Three-Way Dimming

Although we do not currently offer three-way dimming whereby two dimmers can be switched back and forth, we can offer the more traditional ON/OFF or DIM/OFF control between a dimmer and a three-way wall switch. Please contact Everbrite Engineering for details.

Control Operation

The dimmer module switch plate features six push buttons and a blue indicator light. Pressing the “ON MAX” button turns-ON the system with all lamps at full brightness. The operator now has the option of adjusting the intensity by using the “▼” and/or “▲” arrows, or pressing the “ON PRE-SET” button to recall a previous setting from memory. As the brightness level is modified, the blue indicator window will follow that setting. Note that the indicator window will never extinguish completely, even if the OFF button is pressed. This acts as a ‘power good’ indicator and can double as a night-light.

The “ON PRE-SET” memory value can be changed at any time by pressing the “SAVE” button. The current brightness setting will be set into memory as verified by the brief flashing of the indicator light. Pressing the “OFF” button extinguishes all lamps connected to the dimmer without affecting the settings saved into memory. Memory is retained even if power is lost.

Specifications

Input Voltage:	12-24VAC or 15-48VDC, supplied by external Class 2 wall adapter
Input Current:	0.2A
Input Power:	2.4W; 4.8VA (assuming non-PFC wall adapter)
Output Voltage:	0-12VDC Pulse Width Modulated trapezoidal wave
Fault Protection:	Input polarity; output over-voltage and/or short circuit
Operating range:	Output PWM spans 0 – 100%
Operating frequency:	Internal clock = 32.7kHz (Fully MRI compatible) PWM frequency = 130Hz
Controls:	ON MAX – Press to activate dimmer, sets output to FULL ON OFF – Press to turn dimmer/lights OFF ▲ – Press or Press-and-Hold to increase brightness ▼ – Press or Press-and-Hold to decrease brightness SAVE – Place current brightness setting into memory ON PRESET – Recall last ‘saved’ brightness setting
Wiring Method:	Class 2, Shielded Plenum rated ‘patch’ cables with RJ-45 connectors Alternate terminal block for discrete wired installations
Temperature:	Operating: 0°C to + 60°C Storage: -40°C to + 85°C
Mounting:	Attaches to standard single-gang wall switch box, minimum 3” deep. May be located inside the MRI suite with no additional equipment (if allowed by magnet supplier), or in the Control room when a suitable signal filter is installed