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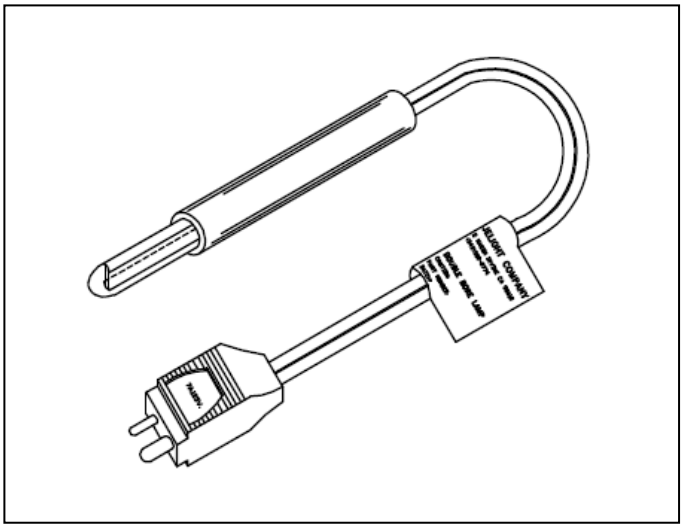
Jelight Company, Inc.
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Irvine, CA 92618
Tel (949) 380-8774 Fax (949) 768-9457

ISO 9001

Low Pressure Mercury Vapor Ozone Producing Double-Bore® Lamp

78-2046-0.75T

- Contaminants free
- Eliminates dangling leads
- Strong isolated spectral lines
- Extremely stable output
- Low operating temperature
- Longer lifetime, up to 30,000 hours
- Warranty: 5,000 hours
- Available in variety of rare gases: argon, neon, krypton, xenon, & helium



Description

The primary irradiance from a Double-Bore® low pressure mercury vapor lamp is in the Ultra-Violet region of the electromagnetic spectra. About 90% of the emitted UV radiation is at the 254 nm mercury resonant line. The spectral width of the 254 nm line is 1Å (0.1 nm).

This lamp produces ozone by generating effective source of 185 nm spectral line (65% transmission) which is absorbed by oxygen molecules. Also, ozone absorbs 254 nm UV radiations and breaks down to oxygen molecules and atoms. Using a spectrometer, mercury spectral lines can be observed at:

184.9 nm, 253.7 nm, 296.5 nm, 302.2 nm
312.6 nm, 313.2 nm, 365.0 nm, 365.5 nm
366.3 nm, 404.7 nm, 435.8 nm, 546.1 nm
577.0 nm, 579.0 nm

The amount of ozone generated by the lamp depends on the following:

- Intensity of 185 nm UV radiation
- Intensity of 254 nm UV radiation
- Type of circulating media gas during operation
- Flow rate of the media gas
- Dimensions of ozone generator chamber

By operating the lamp in oxygen free environment such as nitrogen or argon atmosphere enhances the intensity of 185 nm UV radiation.

Supplying higher current ratings than recommended (20 mA) will result in shorter lifetime. Although the intensity of spectral lines with longer wavelengths will be increased, at the same time, the intensity of spectral lines with shorter wavelengths will be decreased, and the lamp temperature will also become higher than normal.

The output stability is able to be improved by shielding the lamp from RF fields and operating with steady power supply. Also, higher frequency from secondary voltage enhances the stability.

The average lifetime of the lamp when operating under DC mode is reduced by factor of two. The reason is that one electrode (cathode) operates at 100% duty cycle. In DC mode, the mercury inside the lamp tends to migrate away from the cathode. This causes a fluctuation on the output, depending on specific portion of the lamp evaluated at specific ranges of wavelength. The total visible length of the mercury plasma arc is 4 inches.

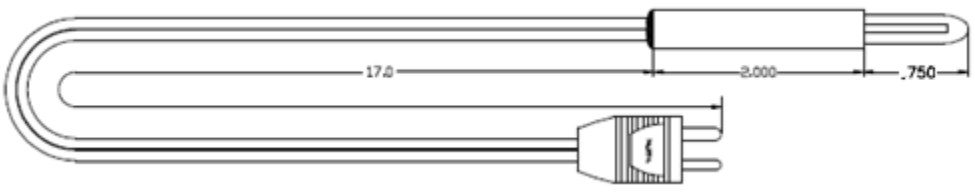
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Characteristics

Description	Unit	Value	Notes
Lighted length	inch	0.75	Material: clear-fused quartz (transmits 65% of 184.9 nm)
Diameter of lamp	mm	6.5	
Recommended power supply Output voltage & current	 V_{rms}/mA_{rms}	 2000/20	P/N PS-2000-20, input: 120V_{AC}/60Hz P/N DC-2460-20, input: 24V_{DC}
Starting voltage	V	600	Tested at room temperature & daylight
Operating voltage	V	260	Tested at room temperature & daylight
Total input power	W	6	Tested at room temperature & daylight
Optimal surface temperature	°C	45 ~ 60	Hot spot: electrode area Cold spot: tip of lamp
Main UV radiation	nm	184.9 & 253.7	Mercury spectral lines
Intensity of 184.9 spectral line (based on average values) -from lamp surface	 mW/cm^2	 1.3	Decreases at the rate of 14% (approx.) for every 1000 hours of continuous lamp operation.
Intensity of 253.7 nm spectral line (based on average values) -from lamp surface -at ¼" from lamp surface -at ½" from lamp surface -at ¾" from lamp surface -at 1.0" from lamp surface	 mW/cm^2 mW/cm^2 mW/cm^2 mW/cm^2 mW/cm^2	 30 16 9 6 4	Decreases at the rate of 10% (approx.) for every 1000 hours of continuous lamp operation.

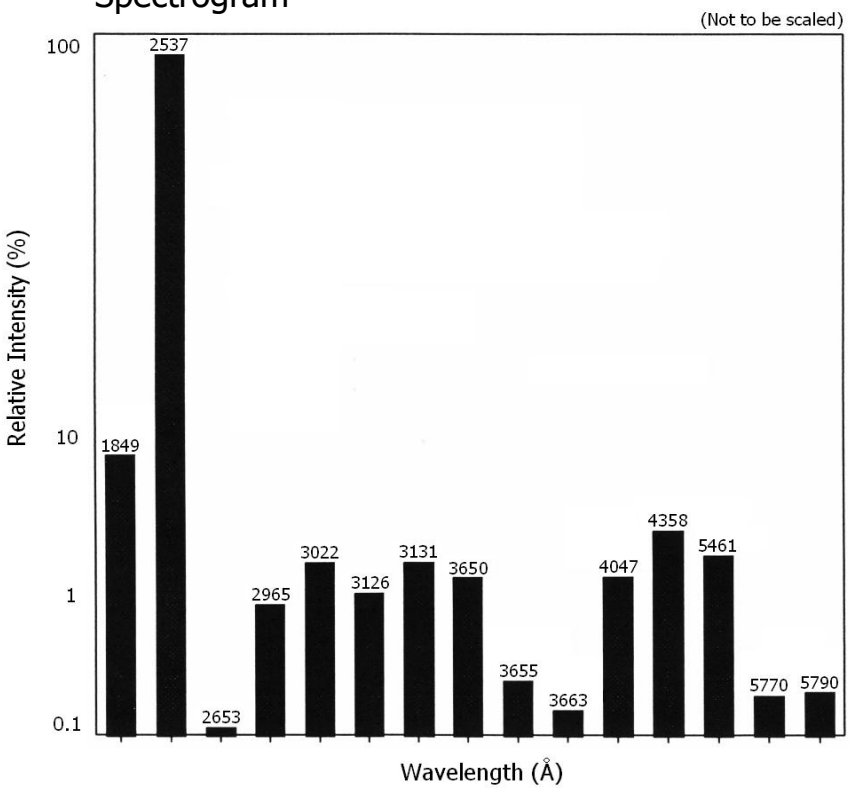
Dimension

Unit: inch



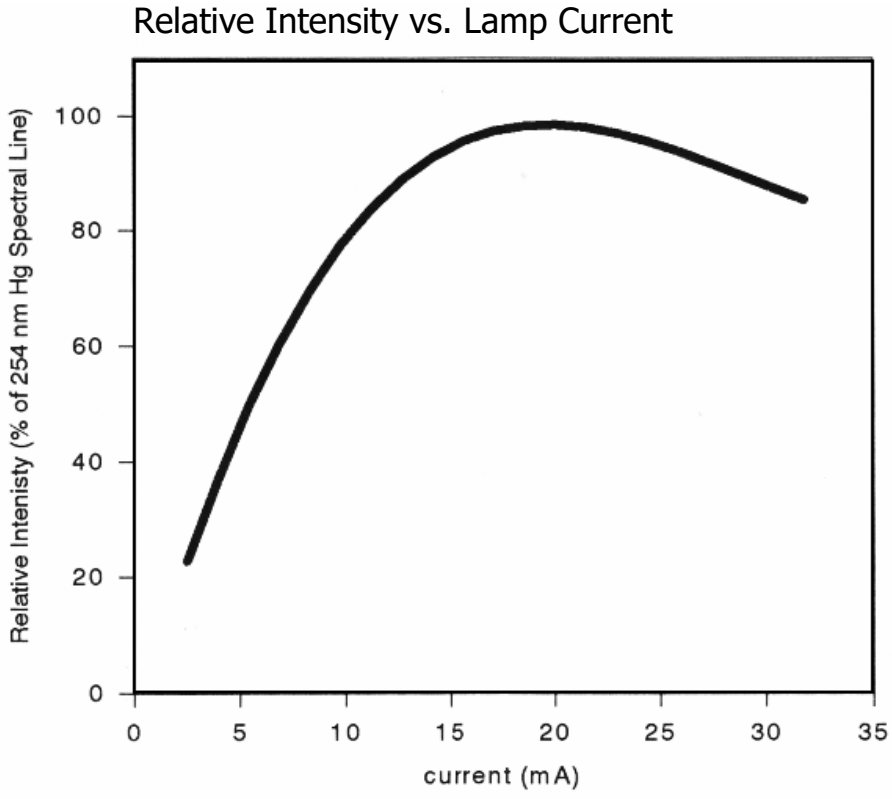
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Spectrogram



About 90% of the radiation emitted by the lamp is at 253.7 nm (2537 Å) mercury spectral line. The spectrogram on the left represents the relative intensity of several prominent mercury spectral lines emitted by this Double-Bore® type lamp. The operated condition is at an ideal temperature with input frequency of 60 Hz and alternating current of 20 mA. When the input current and operation temperature rises, the longer wavelengths of radiation tend to become stronger. With the help of spectrometer and proper resolution, it is possible to observe many additional spectral lines.

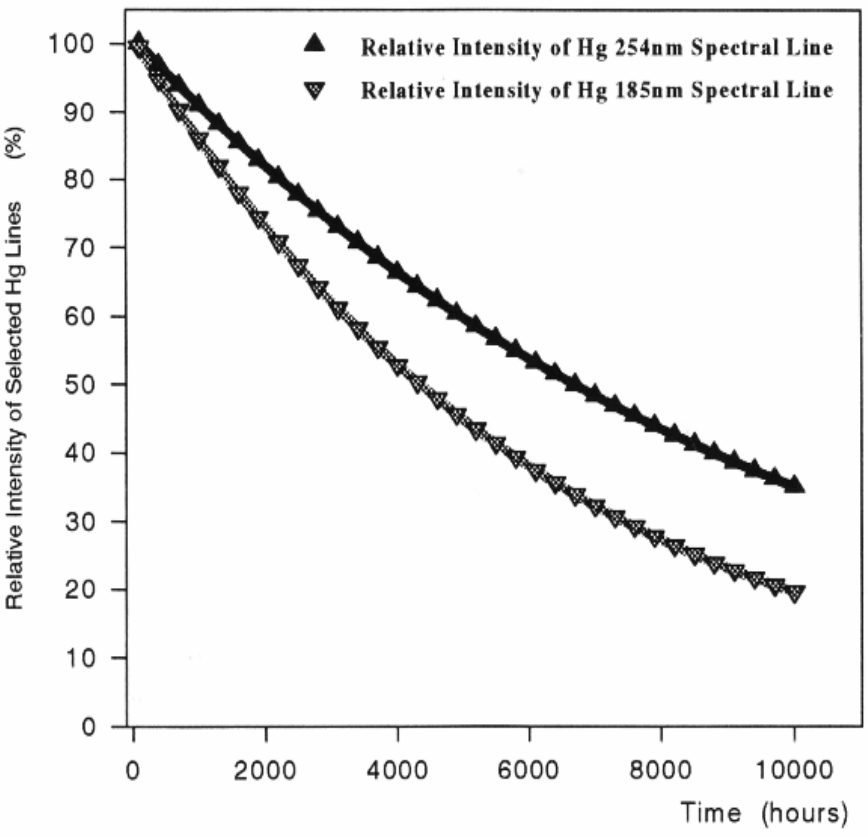
Relative Intensity vs. Lamp Current



The intensity of radiation emitted by the lamp is a function of operating current. The optimal operating current for the emission of 253.7 nm UV radiation is measured between 18 ~ 20 mA_{rms}.

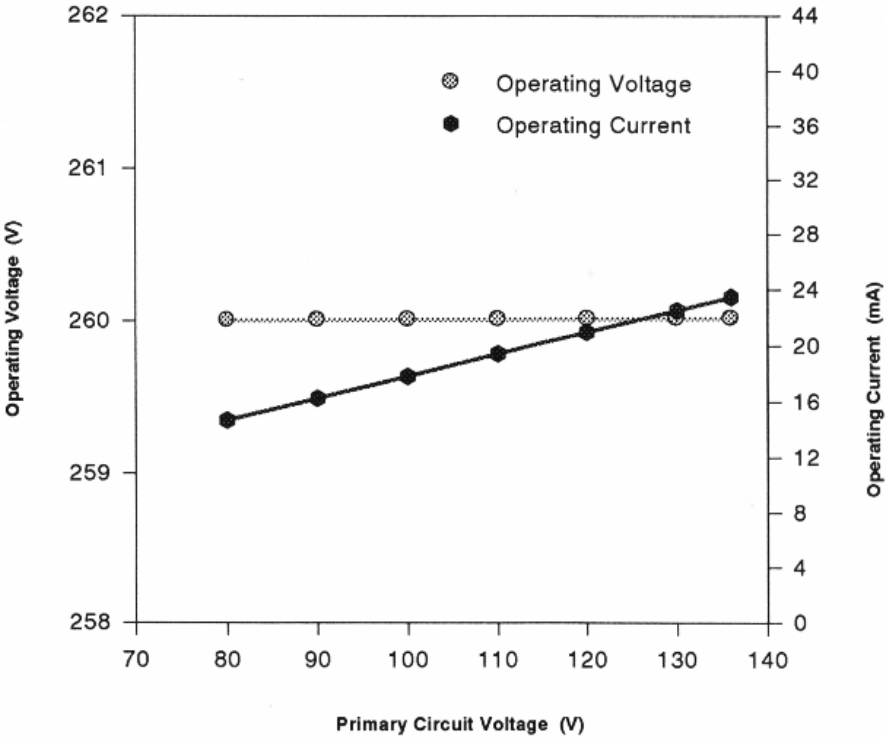
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Relative intensity vs. time



Lamp intensity is a complicated function of many parameters. It decreases over time. The graph on the right depicts the decrease in lamp intensity for continuous operation at its optimal current with thermally stable environment in standard atmosphere. Running the lamp at higher than optimal current level will shorten the lamp life. Furthermore, Running the lamp at lower than optimal current level will extend the lamp life. The lifetime from the application point of view may be longer or shorter than natural lifetime depending on the operational conditions and minimum level of radiation required. The operating voltage may increase by 10% during the lifetime. The intensity at 254 nm radiation decays at a rate of 10% for every 1000 hours of continuous operation at optimal current and temperature.

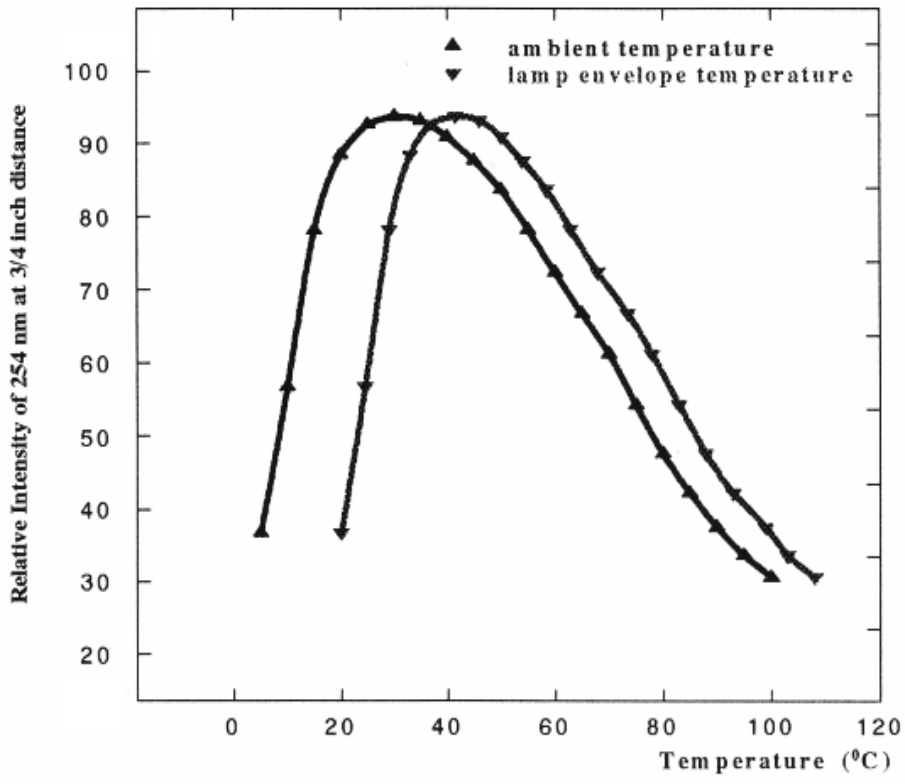
Operating voltage & current vs. primary circuit voltage



The operating temperature, output stability, and intensity of spectral lines emitted by the lamp are depended on the operating current. This graph demonstrates the change in operating current as the primary voltage of the power supply (P/N: PS-2000-20) is varied. It is common to experience about 10% variation in the primary voltage when the electric power from the common power line is used. This may cause a slight effect on the performance. The DC-AC power supply, P/N: DC-2460-20, operating at 30 kHz, eliminates the effect of the primary voltage fluctuation while providing stable lamp current, but the lifetime is reduced by factor of two.

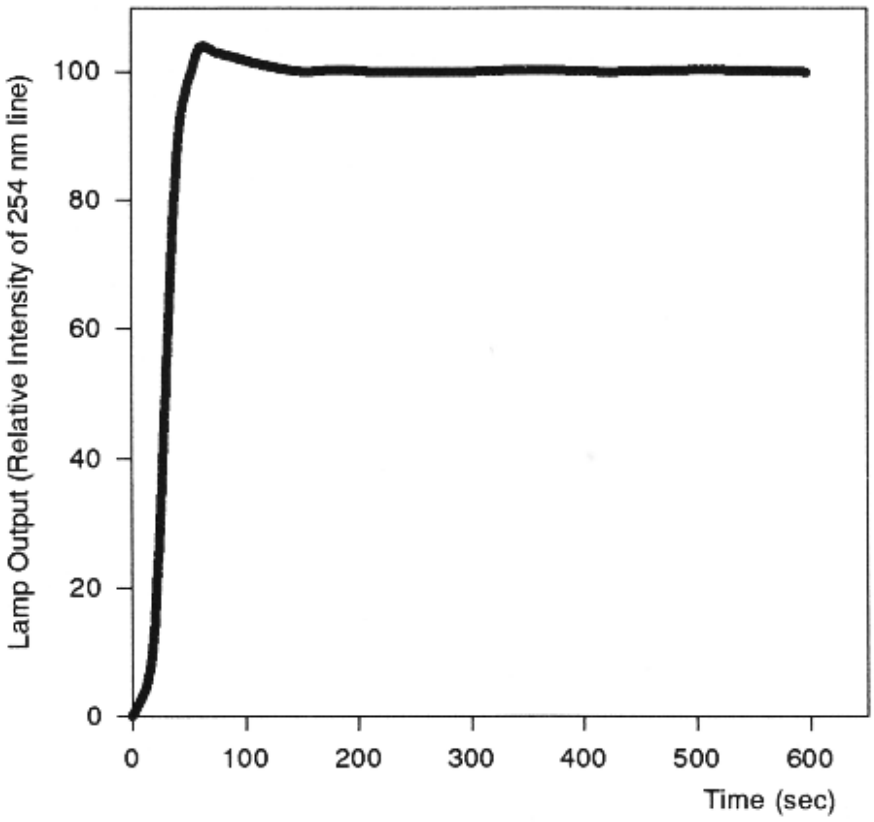
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Relative intensity vs. temperature



This diagram shows the dependence of the lamp output at 254 nm UV spectral line as a function of temperature in thermal equilibrium. The temperature of the lamp body is higher than that of the ambient. The maximum output of 254 nm radiation requires the temperature on the lamp surface equals to 40 ~ 45°C with ambient temperature of 25 ~ 30°C. Proper thermal environment is essential for stable operation. The performance is affected by working in higher or lower temperature range. The distribution of temperature along the lamp body is not uniform. The peak temperature on the lamp body is in the electrode area. It can reach up to 20°C higher than the temperature on the tip. The best viewing spot is 2/3 of lighted length away from electrode area.

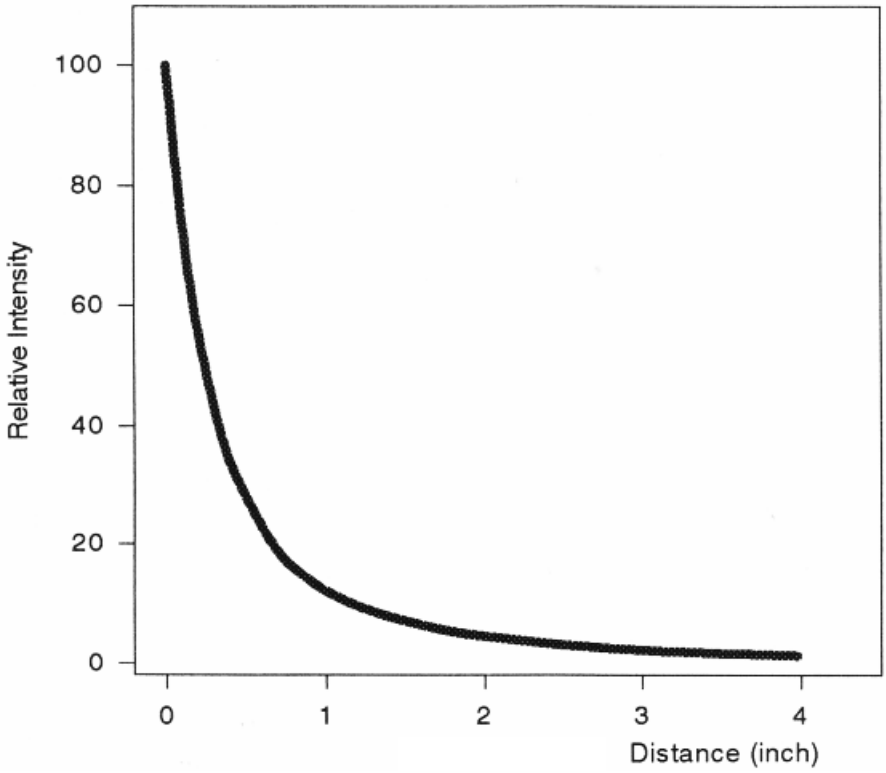
Stabilization of lamp at startup



The ignition of the low pressure gas discharge lamp is a complicated process with rather interesting dynamics. Within two minutes after the moment of ignition by a sufficient high voltage from the power supply, the lamp reaches its optimal performance level as measured by intensity of 254 nm spectral line. The lamp reaches stable condition beyond this point. However, it may take from 30 ~ 60 minutes from initial strike before the lamp's noise and drift are stabilized. The exact time is dependent on particular application.

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Relative intensity vs. distance



The lamp intensity at distances up to several inches does not follow the inverse square law because it is a linear source of finite size. The characteristic of this type of lamp demonstrates that the intensity of UV radiation is significantly reduced when the distance is beyond one inch. However, the most ideal distance at which to use the lamp depends on particular application.

Notes:
-"*Double-Bore*" is a registered trademark of Jelight Company Inc.

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