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Photon Technology International

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PTI Model A-1010 Lamp Housing OPERATION MANUAL

Also applicable to the PowerArc

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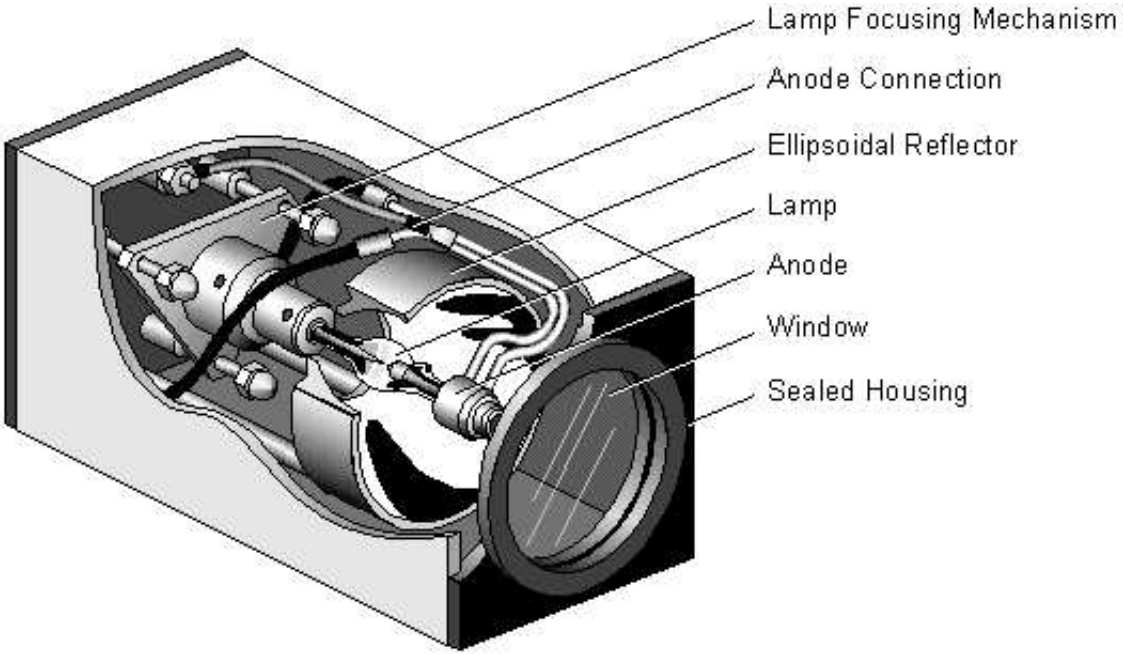
1. DESCRIPTION

INTRODUCTION

The PTI Model A-1010 Arc Lamp Housing is designed to accommodate a variety of Xenon, Mercury and Mercury-Xenon high pressure short arc lamps with power ratings of 75 to 200 watts, as well as technical Tungsten-Halogen lamps. The housing features an f/4.5 elliptical reflector which provides highly efficient light collection; other reflectors are available on special order. The unit is completely sealed and the lamp anode is water cooled via the anode adapter when necessary;

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access is provided for nitrogen purging. It may be operated in either vertical or horizontal positions, depending on the lamp in use.



> ***WARNING:*** **Never look directly at an operating arc lamp; severe eye injury will result. Wear U.V. protective lenses, such as a welder's helmet, when working around operating arc lamps.**

POWER SUPPLY

The A-1010 is compatible with PTI Models LPS-220 and LPS-250 power supplies, but may be used with power supplies from other manufacturers. In any case, please refer to the power supply manual for electrical connections and operating instructions.

> ***WARNING:*** **Use caution when disconnecting the power supply from the lamp housing. High voltage arcing can occur between the power lead connectors and any nearby metallic objects, and can cause personal injury.**

LAMPS

Compact Arc Lamps

High pressure gas discharge lamps having an arc length which is small compared with the size of the electrodes are called short arc or compact arc lamps. Depending on rated wattage and intended application, the arc length of these lamps may vary

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from about a third of a millimeter to about a centimeter. These lamps have the highest luminance and radiance of any continuously operating light source and are the closest approach to a true "point" source.

The envelope is made from optically clear quartz material of various grades and has a spherical or ellipsoidal shape. The grade of the quartz will determine the amount of ozone generated. The most widely used material for the electrodes is tungsten.

Most compact arc lamps are designed for DC operation. This results in better arc stability and substantially longer life. DC systems consist of an igniter and a regulated power supply. High voltage pulses (up to 50,000 volts) break down the gap between the electrodes, ionize the gas and heat the cathode tip to thermionic emitting temperatures.

Xenon Lamps

Xenon compact arc lamps are filled with several atmospheres of xenon gas. They reach 80% of final output within 10 minutes or less of starting. The arc color is very close to daylight (6000 deg. K). The spectrum is continuous in the visible range and extends far into the ultraviolet. A Xenon lamp exhibits strong lines in the near infrared between 800 and 1000 nm and some weak lines in the blue portion of the spectrum.

Xenon compact arc lamps are made with rated wattages from 75 to 30,000 watts and are available for operation in either a vertical or horizontal position. The breakdown voltage between the electrodes will run from 10kv for a small lamp up to 60kv or more for lamps rated 30kw.

The luminous efficacy of Xenon compact arc lamps is approx. 30 lumens per watt at 1000 watts, 45 lumens per watt at 5000 watts, and over 150 lumens per watt at 20kw.

Mercury-Xenon Lamps

A Mercury-Xenon lamp contains a specific amount of mercury and a small amount of xenon added at a pressure exceeding one atmosphere. The xenon is necessary to facilitate starting and to sustain the arc until the mercury is fully vaporized; it also reduces the warm-up period. Normal warm-up time is 10-15 minutes.

Mercury lamps are sensitive to cooling because the bulb temperature determines the vapor pressure. The lamp can be over-cooled to the point that full output in the mercury spectrum is never achieved. The cooling water should be ordinary tap water. Chilled water may decrease the operating voltage and interfere with the proper evaporation of mercury. In some cases, the mercury may not evaporate at all, causing unsuitable performance and shortened lamp life.

Typical steady state voltage of a Mercury-Xenon lamp is higher than that of a xenon lamp. The output in the visible range consists mainly of four mercury lines and some

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continuum, due to the high operating pressure. A properly warmed lamp will show no significant trace of the xenon gas spectrum.

Mercury-Xenon lamps are available in wattages from 200 to 7000 watts. The luminous efficacy is approximately 50 lumens per watt at 1000 watts and about 55 lumens per watt at 5000 watts.

Tungsten Lamps

Technical lamps consist of a coiled tungsten filament mounted in a precision glass envelope. The envelope may have a vacuum or, more commonly, be filled with an inert gas such as argon or krypton. Typical technical lamp operating parameters are 2.5 to 12 volts and .02 to 1 amp. Color temperature ranges from 2,200 to 3,000 degrees Kelvin; lamp life may be as high as 30,000 hours.

Tungsten-Halogen lamps feature a tungsten coil filament mounted in a quartz glass envelope that has been filled with an inert gas plus a trace of halogen (normally bromine). This gas creates the “halogen cycle”: tungsten that has evaporated from the filament combines with the halogen gas. Convection currents within the bulb carry this gas to the quartz wall where it is cooled and then returned to the proximity of the filament. The heat of the filament causes the tungsten and bromine to separate, and the tungsten is then deposited on the cold portion of the filament.

This regenerative process prolongs the life of the filament considerably, and also eliminates blackening of the bulb by preventing the evaporated tungsten from condensing on the envelope. The Halogen lamp color temperature runs from 2900 to 3400 deg. Kelvin and are available in wattages from 10 to 250 at operating voltages from 6 to 24; lamp life ranges from 10 to 2500 hours. Luminous efficiency is approximately 22 lumens per watt.

Tungsten-Halogen lamps must be operated at voltages that maintain an envelope temperature between 250 and 350 deg. C. Cooler temperatures will not allow the halogen cycle to take place, thus causing bulb blackening and shorter life; higher temperatures will cause oxidation of the conductors and lead to premature lamp failure.

Recommended Lamps

The following lamps are recommended for use in the A-1010, most of which are available from PTI. Anode and cathode adapters are required to accommodate the various lamps in the housing.

Mfr.: Lamp Model (Adapter Required)
Osram: XBO 75W/Z Xe 75/100W anode & cathode adapter)
Osram: XBO 150W W/S Xe (150W 12.6mm anode adapter)
Ushio: UXL 75W Xe (75/100W anode & cathode adapter)
Ushio: UXL 75W CLS Xe (75/100W anode & cathode adapter)
Ushio: UXL 100D Xe Hg (75/100W anode & cathode adapter)

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Ushio: UXL 200H Hg Xe (150/200W 13mm anode adapter)
Ushio: UXL 151H Xe (150/200W 13mm anode adapter)

Osram and Ushio anodes are different diameters which necessitate different anode adapters. Ushio 150- and 200-watt lamps do not require cathode adapters. PTI also offers tungsten lamps and adapters for use in the A-1010 housing.

NOTE: Lamps purchased directly from other manufacturers may not meet our specifications for operation in the A-1010 and may cause permanent damage to the housing. Use of such lamps will void the Warranty.

Note that higher wattage lamps do not necessarily yield more light intensity. When higher illumination intensity is needed, lamps must be selected with greater brightness, and this does not always increase with lamp wattage.

Lamp Handling

> ***WARNING:*** **Compact arc lamps contain highly pressurized gas, and present an explosion hazard even when cold. Wear face protection, such as a welder's helmet, whenever handling lamps.**

Special storage cases are provided to eliminate possible hazards during shipping and handling. Safety goggles and soft cotton gloves should be worn when removing and installing lamps. Never touch the quartz envelope with bare hands; such handling may lead to deterioration and premature failure. If accidentally handled, clean the lamp surface with an alcohol swab to remove any residue.

> ***WARNING:*** **Never look directly at an operating arc lamp; severe eye injury will result. Wear U.V. protective lenses, such as a welder's helmet, when working around operating arc lamps.**

Polarization

Some lamps can only be mounted one way in the A-1010 housing since the anode (+) and cathode (-) have different diameters, thus making accidental polarization reversal nearly impossible. However, some lamps have the same diameter anode and cathode, allowing room for error. Refer to the lamp manufacturer's data sheet for proper identification of the anode and cathode.

IMPORTANT: Reversed polarization will result in immediate and permanent damage to the lamp electrodes. PTI will not warrant or replace a lamp which has been improperly mounted.

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A lamp that has been fired with reversed polarization will have obvious physical damage to the electrodes. A damaged lamp will fire, but it will exhibit unstable performance and a severely shortened operating life.

Lamp Stability

Short term stability is measured over seconds, while long term stability is measured over minutes, hours, or even days.

Short term stability is affected by arc "wander," "flare" and "flutter." Arc wander is the movement of the attachment point of the arc on the cathode surface. Typically the arc moves around the conical cathode tip in a circular fashion, taking several seconds to move a full circle. Arc flare refers to the momentary change in brightness as the arc moves to an area on the cathode having a preferential emissive quality over the previous attachment point. Arc flutter is the rapid side-to-side displacement of the arc column as it is buffetted by convection currents in the xenon gas which are caused as the gas is heated by the arc and cooled by the envelope walls.

Arc wander and flare can be reduced by a slight decrease in the operating current. For example, a 75 watt xenon lamp rated at 5.4 amps may be operated at 4.5 amps for the first one or two minutes of operation, after which the current should be brought up to the specified normal operating level.

Lamp Life

The useful life of compact arc lamps is determined primarily by the decrease of luminous flux caused by the deposit of evaporated electrode material on the inner wall of the envelope. Frequent ignition accelerates electrode wear and hastens the blackening of the envelope. Average lamp life is based on approximately 20 minutes of operation for each ignition. The end of the lamp life is the point at which the UV output has decreased by approximately 25%, the arc instability has increased beyond 10%, or the lamp has ceased to operate under specified conditions. Lamps should be replaced when the average lamp life has been exceeded by 25%.

As the lamp ages, the operating voltage will increase. Lamp current should be decreased to maintain output until the minimum operating current is reached. At this time the lamp should be replaced.

Lamp life varies with different types. Check the manufacturer's specifications for the rated lamp life.

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2. INSTALLATION

LAMP INSTALATION

The arc lamp, if ordered with the lamp housing, is shipped separately in its original

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packaging and must be installed before using the A-1010.

> ***WARNING:*** **Compact arc lamps contain highly pressurized gas, and present an explosion hazard even when cold. Wear face protection, such as a welder's helmet, whenever handling lamps.**

1) Remove the four phillips-head screws on the back plate of the lamp housing and slide the lamp assembly out.

2) The cathode adapter stand must be given a coarse adjustment. Using a caliper, adjust the distance between the outer surfaces of the cathode adapter stand and the lamp housing back plate, according to the table below.

Lamp Type: Cathode Adapter Stand Offset
02-75-XEO 75W Xenon: 50.8mm (2 in.)
02-100-Hg 100W Mercury: 50.8mm (2 in.)
02-150-XEO 150W Xenon: 53.0mm (2.09 in.)

3) Insert the lamp cathode (-) in the cathode adapter and tighten the two set screws.

4) Slip the anode adapter over the lamp anode (+) and tighten the set screw.

> ***CAUTION:*** **The anode adapter should not put any mechanical stress on the lamp. It may be necessary to bend the wire to the adapter in order to relieve any stress on the lamp.**

5) Be sure all water lines are snug. (75-watt Xenon lamps do not require cooling, so the water lines may be omitted.) Connect the water lines to the supply, start water flow and check all internal connections for leaks.

6) Insert the lamp assembly into the housing, ensuring that the anode adapter leads face the insulated inside corner of the housing. Tighten the four back plate screws securely.

FOCUSING

NOTE: When the A-1010 is part of an illumination system, the focusing instructions listed below may not apply. Please check the operating manual of the illumination system for specific focusing procedures.

Since no two arc lamps are identical and since it is impossible at best to perform a lamp replacement without altering any adjustments, the lamp must be refocused after replacement.

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> *CAUTION:* **U.V. eye protection, such as a welder's helmet, must be worn when adjusting the lamp focus. Do not place hands or combustible materials in the focus of the light beam.**

1) Place a dark, non-combustible flat surface at the focal point of the reflector such that it is parallel to the front of the housing. The focal point for the standard f/4.5 reflector is 280mm (approx. 11 in.). For the focal point of other reflectors, refer to their specifications.

2) Connect the lamp housing to the power supply and connect the cooling water lines (as necessary).

3) Fire the lamp and turn the three lamp adjustment screws on the rear of the housing until the lamp is in focus. A properly focused lamp will produce a round bright spot surrounded by a dim circular halo.

> *WARNING:* **Make only progressive 1/4-turn adjustments on each of the three screws at a time. Larger turns will place excessive stress on the lamp and the lamp could explode as a result. Be sure to turn all three screws the same amount in the same direction.**

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3. OPERATION

LAMP OPERATION

Compact arc lamps should not be operated below 85% or in excess of 110% of rated current. Operation below rated current results in arc instability and reduced lamp life. Always allow 10-15 minutes for proper warm-up of Xenon and Mercury-Xenon lamps.

The lamps recommended for use in the A-1010 are all specified for horizontal burning. Generally, Xenon lamps and 100 Watt Mercury lamps may be operated horizontally. Mercury lamps (other than the 100 Watt) and Mercury-Xenon lamps are operated vertically. Refer to the lamp manufacturer's data sheet for the recommended lamp operating position. If you have any questions regarding lamp position please call PTI for technical assistance. Failure to mount the lamp properly may result in damage to the lamp, the lamp housing or the power supply.

COOLING

Because of the high thermal load, natural convection cooling is insufficient for lamps

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rated greater than 75 watts. The anode temperature must not exceed 250 deg. C. Proper cooling is evident when the operating voltage after warm-up is within +/-10% of lamp rating. Cooling should be turned on just prior to starting; a cold anode will make lamp firing difficult. The recommended flow rate is 500 ml/minute. Cooling should be kept running for at least five minutes after the lamp has been shut off. Failure to maintain proper cooling may result in lamp damage and possibly lamp explosion.

In view of the low operating voltage of the lamps, high current is required. High contact resistance can cause the lamp fittings to overheat. In order to avoid damage to the lamp or power supply, check all connections at regular intervals.

> ***CAUTION:*** **Before connecting coolant lines, open the housing and verify that internal hoses exist, are tight, and have no kinks. If this check is not carried out, the lamp housing could flood with water and present explosion and electrocution hazards.**

When applicable, proper cooling will assure long lamp life and stability. The recommended flow rate is 500ml/minute. Chilled water should not be used; typically, tap water is sufficient to cool the lamp properly. Cooling the lamp prior to starting is not recommended, as condensation may form on the anode adapter making firing difficult if not impossible.

When using ordinary tap water for lamp cooling, note that CaCl2 or MgCl2 condensates may form in the “water out” reflector support rod. Flushing the cooling system with vinegar or acetic acid once a month will prevent condensate build-up.

NOTE: Improper cooling will shorten lamp life and may cause permanent damage to the lamp.

75-watt Xenon lamps do not require cooling.

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4. SERVICE

> ***WARNING:*** **Before servicing the lamp housing, be sure to disconnect the electric lines and completely drain the cooling system; pressurized air applied at the water inlet is recommended for removal of any remaining water. Make certain the lamp is at room temperature. Also remember that compact arc lamps contain highly pressurized gas, and present an explosion hazard even when cold. Wear face protection, such as a welder's helmet, whenever handling lamps.**

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LAMP REPLACEMENT

To replace the lamp, follow the first-time LAMP INSTALLATION procedure.

REPLACING THE REFLECTOR

1) Remove the four phillips-head screws on the back plate of the lamp housing and slide the lamp assembly out.

2) Remove the anode adapter from the lamp and remove the lamp.

3) Loosen the two set screws which hold the reflector to the mounting posts and remove the reflector.

NOTE: Do not touch the reflector surface. If you do, clean it with alcohol to remove any residue; otherwise, permanent damage may occur. Call PTI for assistance.

4) Put the new reflector on and tighten the set screws.

5) Insert the lamp assembly into the housing, ensuring that the anode adapter leads face the insulated inside corner of the housing. Tighten the four back plate screws securely.

6) Follow the LAMP FOCUSING procedure.

REPLACING THE ANODE ADAPTER

1) Remove the four phillips-head screws on the back plate of the lamp housing and slide the lamp assembly out.

2) Loosen the anode adapter set screw and slip it off of the lamp.

3) Disconnect the wire to the anode adapter by gently pulling off the electrical connector.

4) Remove the cooling tubes from the frame by turning the knurled locking rings until they are free and pulling the tubing off the connectors.

5) Attach the new anode adapter cooling tubes to the frame and reconnect the electrical wire. Slip the anode adapter over the lamp anode and tighten the set screw.

> ***CAUTION:*** **The anode adapter should not put any mechanical stress on the lamp. It may be necessary to bend the lead wire to the adapter in order to relieve any stress on the lamp.**

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6) Connect the water lines to the supply, start water flow and check all internal connections for leaks.

7) Insert the lamp assembly into the housing, ensuring that the anode adapter leads face the insulated inside corner of the housing. Tighten the four back plate screws securely.

8) Follow the LAMP FOCUSING procedure.

REPLACING THE WINDOW

1) The window is secured to the front end of the lamp housing with a retaining ring. Remove the four phillips-head screws on the retaining ring.

2) Replace the window and reattach the retaining ring securely.

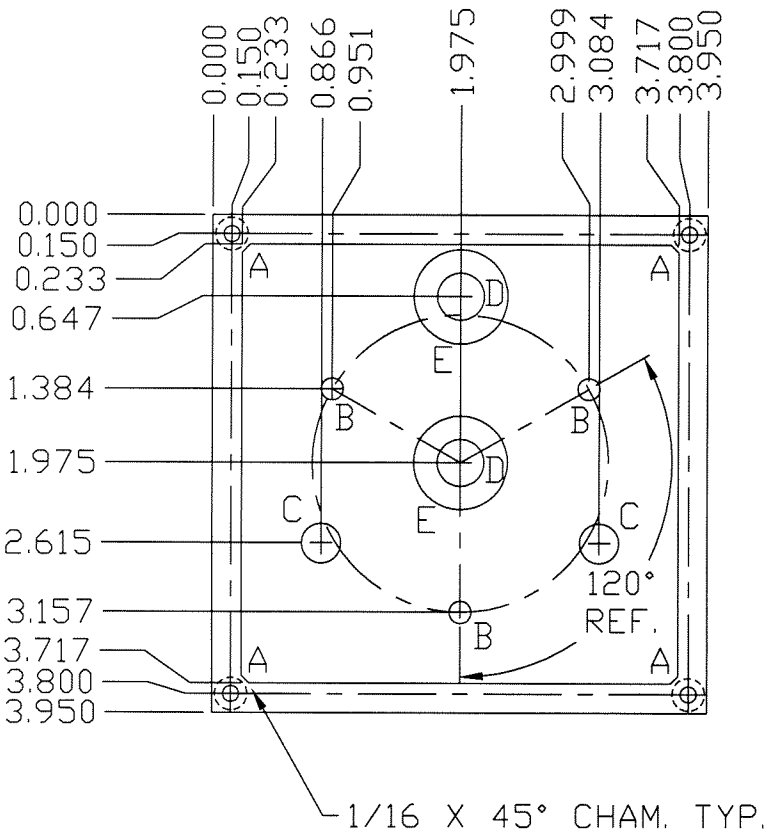
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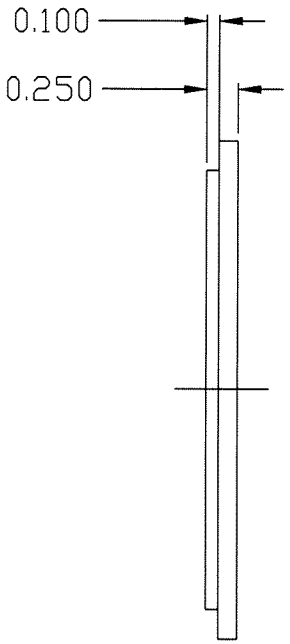
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PROGRAM #8





REF	HOLE SIZE	QTY
A	0.128 DIA THROUGH C'SINK 0.260 DIA @ 90° FROM OTHER SIDE	4
B	0.177 DIA THROUGH ON A 2.364 PCD	3
C	8mm DIA REAM THRU	2
D	0.375 DIA THROUGH	2
E	C'BORE Ø0.75 x 0.125	2

MATL. 270-1050

REMOVE ALL BURRS AND
BREAK ALL SHARP EDGES

DATE	NO.	DESCRIPTION	APPR.
APR/04	A	RE-DIMN. DATUMS	
Jan 13 /97		STEP ON PLATE WAS 0.04 NOW 0.100	RG
Jan 13 /97	960015B	Ø0.75 C'BORE ADDED HOLE 'E'	RG
Jan 13 /97	960015	Note 8 has changed from Ø0.50 to Ø0.375	RG

REVISIONS

MATERIAL NO.: .25 plt
PROJECT: POWERARC
FINISH: ADZ/SLK

PHOTON TECHNOLOGY INTERNATIONAL

DRAWN BY : Rich Gratton
CHECKED BY : Rich Gratton
DATE : Jan 13 97
SHEET SIZE : B

PLT BK POWERARC
ADZ/SLK

TOLERANCES UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS IN INCHES (MM)
ANGLES: ±1/2° FINISH: 63

INCHES	MILLIMETERS
.XX=±0.015	.XX=±0.038
.XXX=±0.003	.XXX=±0.127

PLOT DATE : Sept 16/97
SCALE :
SHEET NO. 1 OF 1
DRAWING NO. 030-0004

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