81190-M

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1000 WATT SOLAR SIMULATOR

MODELS 81190

Please read these instructions completely before operating this equipment. If there are any questions or problems regarding the use of this equipment, please contact: ORIEL INSTRUMENTS - or - the representative from whom this equipment was purchased.

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I. SAFETY

DO NOT OPERATE THIS EQUIPMENT UNTIL YOU READ THIS MANUAL. THERE ARE SIX TYPES OF HAZARD ASSOCIATED WITH THE OPERATION OF THIS EQUIPMENT. THESE HAZARDS ARE FROM VOLTAGES WITHIN THE UNIT AND POWER SUPPLY, FROM ULTRAVIOLET LIGHT AND FROM OZONE CREATED BY THIS LIGHT. THE ILLUMINATOR IS INTERLOCKED SO THAT WHEN IN NORMAL OPERATION NONE OF THESE HAZARDS POSE A PROBLEM. IT IS EXPECTED THAT THE ILLUMINATOR IS PROPERLY VENTED SO THAT ANY OZONE PRODUCED IS VENTED TO A SUITABLY LARGE DILUTION OR INTO AN OZONE FILTER. IN NORMAL OPERATION THERE IS NO HAZARD.

HAZARDS DUE TO ELECTRICAL SHOCK

As stated above, there is no hazard associated with normal operation. Normal operation means the power supply and illuminator are operated at specified current and voltage, with their covers in place and the cables properly connected. Incorrect connection of the cables, which is possible as the design allows for operation of different types of arc lamps, is hazardous to the equipment for it can result in violent lamp explosion.

The power supply provides voltages and currents which could be **lethal**. Do not operate the power supply unless the illuminator and power supply are properly cables. **Do not remove the cover of the power supply and turn it on.** If there is a need to remove the cover, first turn the unit **off**, give the internal capacitors several minutes to discharge, check that the voltage is zero on the front panel meter and disconnect the supply from the AC line. See the power supply manual for complete instructions.

The illuminator has very high internal voltages. An ignition pulse of several kilovolts is used to start the lamp. ***This high voltage could, under some circumstance, become lethal.*** Do not attempt to operate the illuminator with the interlocks defeated to allow access to the inside of the unit.

For complete instructions on proper operation read all of this manual and the power supply manual.

HAZARDS DUE TO ULTRAVIOLET RADIATION

This unit produces copious amounts of **ultraviolet radiation (UV)**. This radiation can cause UV burns of the skin or of the outer layers of the eye. As with sunlight there is a risk that cumulative exposure caused skin cancer. The unit is designed so in normal operation the user is not exposed to the UV. Avoid exposure to the direct, reflected or diffused UV from the lamp or the unit itself.

If exposure to the UV is necessary, wear suitable safety glasses and protective clothing including gloves. Contact Oriel for safety glasses and gloves.

HAZARDS DUE TO OZONE

Ultraviolet light produces ozone which is normally vented from the system in the cooling air flow. If vented into an enclosed space the ozone concentration can build to beyond the 1 ppm maximum recommended exposure level. Ozone is considered toxic inasmuch as it can induce headaches and flu like symptoms. Susceptibility varies significantly from individual to individual. Therefore ensure that proper venting is employed or connect the air outlet to an Oriel Ozone Eater.

LAMP HAZARDS

The lamps used in this equipment are filled with rare gas at supra atmospheric pressure. There is always a danger of lamp explosion due to mechanical failure. This is particularly true when the lamps are operating, as the internal pressure can reach tens of atmospheres. Thermal strains due to incorrect cooling of the envelope or seal area of the lamp can cause lamp failure.

Wear appropriate gloves and goggles when handling the lamps. Avoid any mechanical strain in handling.

Do not contaminate the lamp envelope with fingerprints or other stains. Such stains can burn into the quartz and weaken the envelope. Do not operate the unit without the sheetmetal enclosure complete. [This unit is interlocked so the interlock must be defeated to operate with the lamp exposed.]

EMI

Ignition of an arc lamp requires high voltage/high frequency (100's of kHz) pulses. A high current dump (kHz discharge) follows. Both of these are sources of electromagnetic interferences-both radiated and conducted. Good earthing and cable routing practice and EMI shielding may be necessary to protect sensitive digital circuitry from these pulses. We recommend to start the lamp before powering nearby computers; keep computer at least 6 feet away from the light source; use different outlets for the computer and the light source (ignitor/power supply in particular).

HEAT

Arc lamps become very hot after a few minutes of operation and remain very hot for up to 10-15 minutes after being shut off.

RECOMMENDATIONS

When working with a Solar Simulator:

- always wear protective goggles and gloves
- never look directly into the output beam
- never look at the specular reflection of the beam
- never handle an arc lamp with bare hands
- do not apply torque to the lamp
- provide adequate ventilation
- keep all covers of the Solar Simulator in place and do not defeat any of the interlocks.

CAUTION: **ORIEL SOLAR SIMULATORS ARE NOT DESIGNED FOR RESEARCH ON HUMANS!**

II. UNPACKING YOUR SOLAR SIMULATOR

Each solar simulator includes an illuminator housing with built in arc lamp ignitor, an arc lamp power supply, an arc lamp, lamp adapter, lamp heat sink and a set of cables. There are also optional accessories to control, alter and measure the light output. Remove the Solar Simulator from shipping containers and verify that primary items, and any additional accessories that you ordered are accounted for by cross checking the contents against the packing slip. If you cannot locate an item or find any damages, contact Oriel immediately.

UNPACKING THE ILLUMINATOR HOUSING

1. Secure the illuminator housing in working place or at any convenient location.

2. Remove the front access panels to the lamphousing and lenshousing.

3. Remove all packing material.

4. Observe that all optical surfaces are clean and not damaged. Refer to the "cleaning" section for procedures, if any optical surface needs cleaning.

5. Remove the packing material from the rest of the components and identify them.

III. SETTING UP YOUR SOLAR SIMULATOR

SAFETY FIRST

In SECTION I we identified the hazards associated with these light sources. When setting up, and operating a solar simulator, we strongly urge you to:

1) **Wear eye protection (spectacles, goggles, or face shields)**

2) **Wear gloves**

3) **Cover all exposed skin**

INSTALLING THE LAMP

1) Locate and unpack the arc lamp, lamp adapter and heatsink.

2) Remove the arc lamp from the shipping container and assure that lamp envelope is clean (if necessary clean it using alcohol and lint free tissues) and observe that a starter wire is around the lamp envelope.

3) Lamp orientation is critical. Xenon arc lamps are designed to operate with the cathode (negative -) end down regardless of lamp housing configuration.

   If you have a standard configuration housing the ellipsoidal reflector is in the bottom of the lamp housing.

   If you have an inverted configuration housing the ellipsoidal reflector is in the top of the lamp housing.

4) Place an adapter on the cathode (- endcap) if the lamp housing is a standard configuration (Fig. 1a.) or on the anode (+ endcap) if the lamp housing is an inverted configuration. Secure the adapter with the two set screws.

5) Hold lamp by the endcap opposite the lamp adapter and insert the lamp into the ellipsoidal reflector so that the lamp adapter contacts the lamp base. Screw lamp into base being careful not to over tighten. Use your fingers only - do not use pliers, wrenches, etc.

6) Place heatsink over exposed end cap of lamp and secure it with two #10-32 set screws as shown in Fig. 1a or 1b.

7) Insert high voltage flying lead into heatsink and secure it to the heat sink with two #6-32 set screws.

8) Replace lamp access panel.

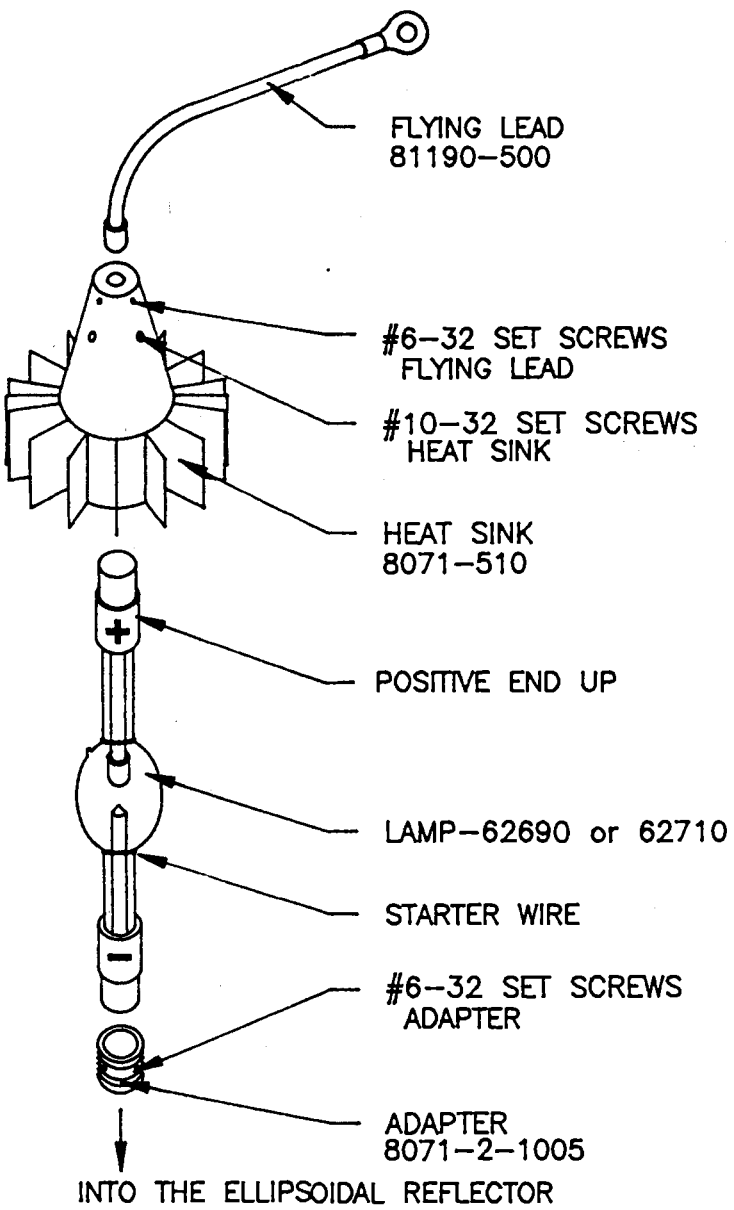


Fig.1a.INSTALLING THE LAMP
(STANDARD CONFIGURATION)

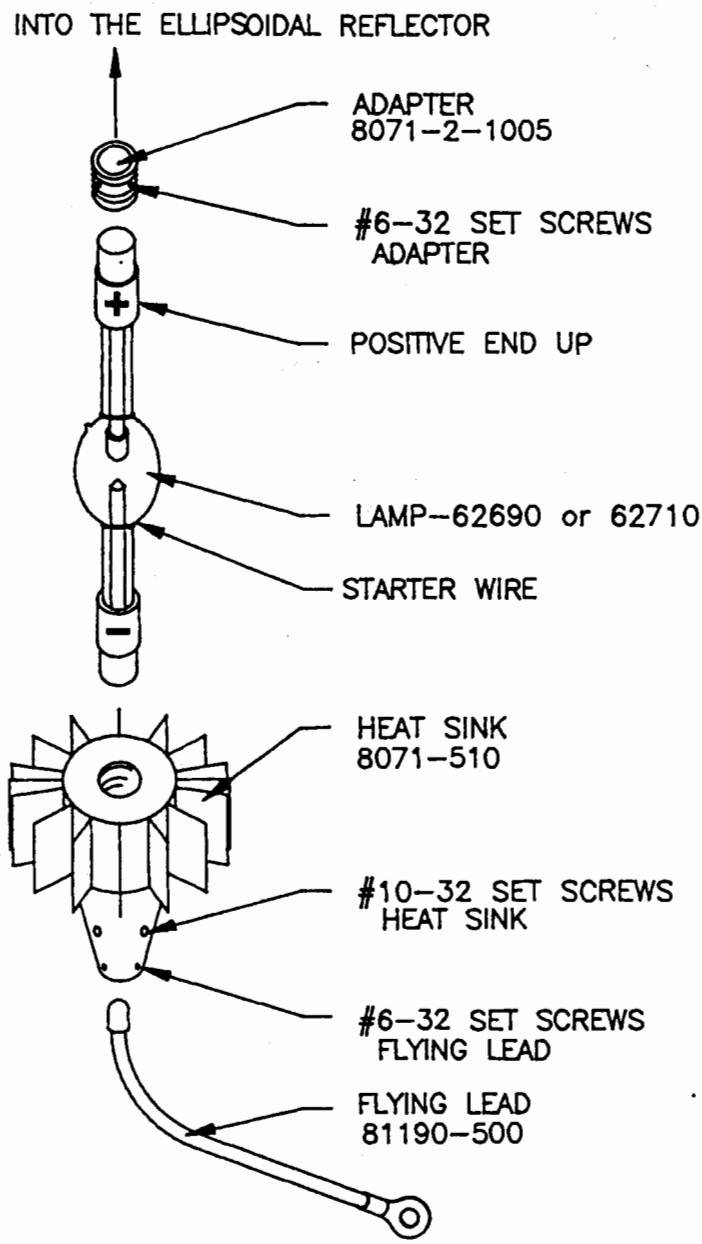


Fig.1b.INSTALLING THE LAMP
(INVERTED CONFIGURATION)

ELECTRICAL CONNECTORS FOR ILLUMINATOR HOUSING

1) Locate, unpack and identify all electrical cables. Refer to figure 2 on the next page for visual procedure for connecting the solar simulator and the optional digital timer and light intensity controllers.

2) Attach the positive (+) high voltage cable-66020-1700- to the positive J1 receptacle located on the rear panel of the illuminator housing and to the positive (+) terminal (red) J6 located on the rear panel of the power supply.

3) Attach the negative (-) high voltage cable-66020-1800 to the negative J2 receptacle located on the rear panel of the illuminator housing and to the negative terminal (black) J7 located on the rear panel of the power supply.

4) Attach the ignitor drive cable-66020-1600-to the receptacle J3 on the rear panel of the illuminator housing and to the receptacle J5 located on the rear panel of the power supply.

5) Attach the interlock cable-66020-1500-to the receptacle J5 located on the rear panel of the illuminator housing and to receptacle J1 located on the rear panel of the power supply.

6) Attach the AC line cord-75-10-002*-to the receptacle J4 located on the rear panel of the illuminator housing.

Note: Receptacle J10 is for the warning sign if used.
Receptacles J7 and J 8 are for the top and bottom cooling fans.

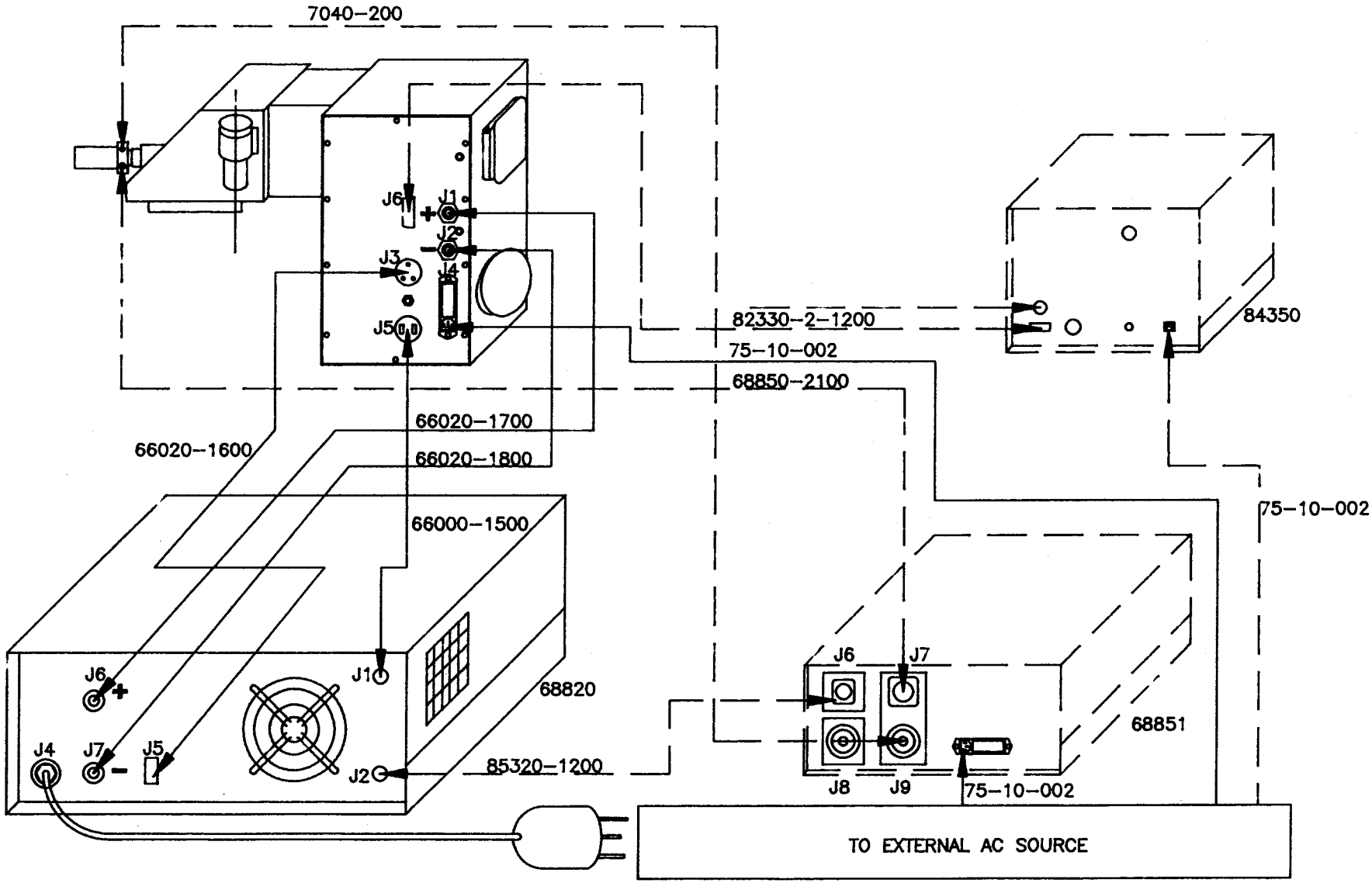


Fig.2.SOLAR SIMULATOR CABLING

OPTIONAL CONNECTIONS FOR ILLUMINATOR HOUSING

84350 DIGITAL TIMER

A) 82330-2-1200 Shutter Control Cable. Connect the male 9 pin connector to the female 9 pin connector located on the rear panel of the digital timer. Connect the female 9 pin connector to the male 9 pin connector J6 located on the rear panel of the illuminator housing.

B) AC line cord. Connect the female connector to the AC receptacle located on the rear panel of the digital timer. Connect the male connector to an AC receptacle.

68851 LIGHT INTENSITY CONTROLLER

A) 68850-2100 Cooler Cable. Attach the 4 pin connector to the detector head, and the 5 pin connector to J7 located on the rear panel of the light intensity controller.

B) 7040-200 Coaxial Cable. Attach one end to the detector head, and the other end to J9 located on the rear panel of the light intensity controller.

C) 85320-1200 Control Cable. Attach the 3 pin connector to J6 located on the rear panel of the light intensity controller, and the 2 pin connector to J2 remote, located on the rear panel of the power supply.

D) AC line cord. Connect the female connector to the AC receptacle located on the rear panel of the light intensity controller. Connect the male connector to an AC receptacle.

IV. OPERATING YOUR SOLAR SIMULATOR

IGNITING THE LAMP

1) Turn the "POWER" switch on, which is located on the Digital Control Panel (Fig.3a) of the lamp access panel. Observe the red indicator light is on.

2) Turn the "POWER" switch on, which is located on the front panel of the power supply(Fig.3b). Observe red light is on.

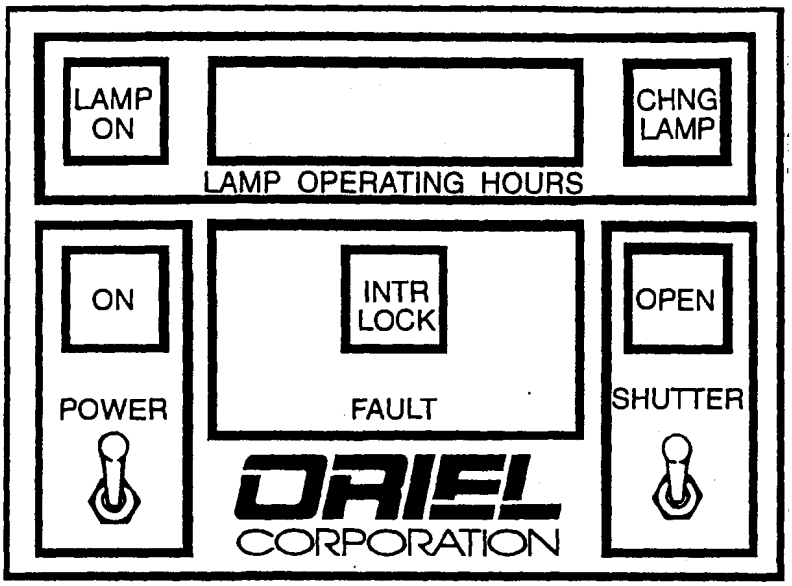
3) Preset lamp operating wattage. Depress "OUTPUT PRE-ADJUST" button, and adjust potentiometer to the desired wattage setting. If a light intensity controller is used see the Photofeedback System manual for further instructions.

4) Flip meter switch to "VOLTS". Observe that you have open circuit voltage (approx. 70 volts for 1000 watt Xe lamp).

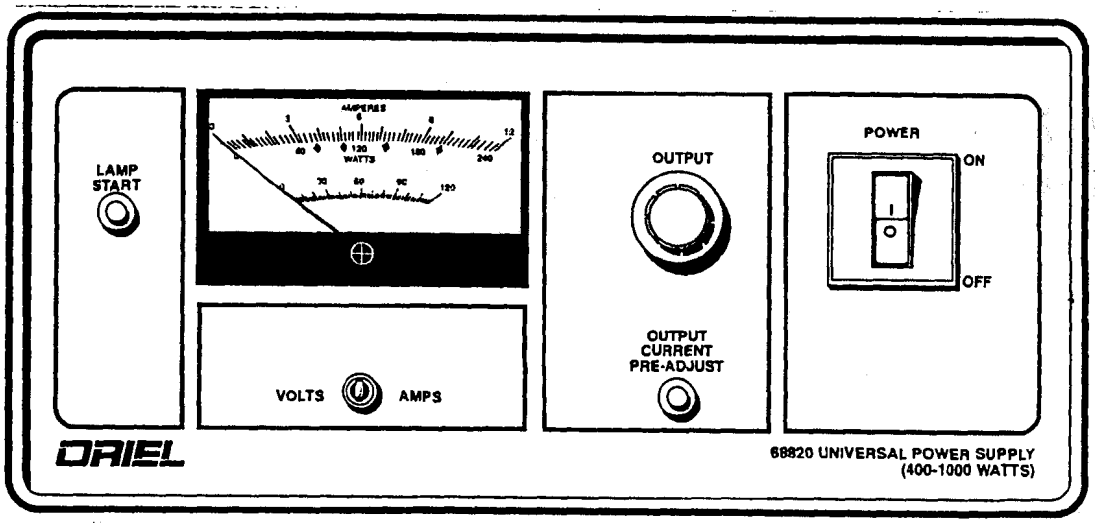
5) Depress "LAMP START" button, holding it in up to four seconds, or until lamp ignites, which ever comes first.

6) Observe that the lamp cooling fan, and the air mass filter blower start running immediately after lamp ignition. If either the muffin fan or filter blower is not operating, shut down the system and call Oriel for assistance.

   NOTE: That in order to cool the lamp the fan and blower will continue to run for 5 to 10 minutes after the lamp is shut off regardless of front panel settings.



a.DIGITAL CONTROL PANEL



b. FRONT PANEL OF 68820 POWER SUPPLY

Fig.3 FRONT PANELS

(a) Illuminator housing, (b) power supply

FOCUSSING THE LAMP

1) Allow lamp to warm up for ten minutes.

2) Remove small lamp adjustment access panel from lamphousing and identify the chain ladder (Z-focusing) and 2 knobs (X/Y-focusing)-see Fig.4.

3) Place radiometer probe at the recommended work distance (work distance is measured from the vertex of the output lens to the plane where light is at the maximum intensity and best uniformity. Refer to the dimensional drawing in the illuminator housing section of this manual to determine the recommended work distance for your source.

4) Turn on your radiometer.

CAUTION these sources produce intense ultraviolet and visible light. Always wear protective eye, hand and skin wear when operating a solar simulator!

5) Locate the "SHUTTER" switch on the digital control panel (see Fig.3.) and open the light shutter. Observe intensity reading on radiometer (mW/cm^2).

6) Focus lamp in Z axis. To do this, slide chain ladder (located in lamp adjustment compartment-Fig.4.) left or right until you achieve maximum intensity reading.

7) Close shutter. Allow probe to cool for five minutes.

8) Open shutter. Focus lamp in X/Yplane- turn one of the knurled knobs left or right until you achieve a maximum intensity reading.

9) Do the same as step 8, but adjust the second knurled knob.

10) Repeat steps 6, 8, and 9 to assure lamp is accurately focused and source is producing maximum intensity.

11) Your lamp is now focused. Close the light shutter. Replace access panel for lamp adjust compartment.

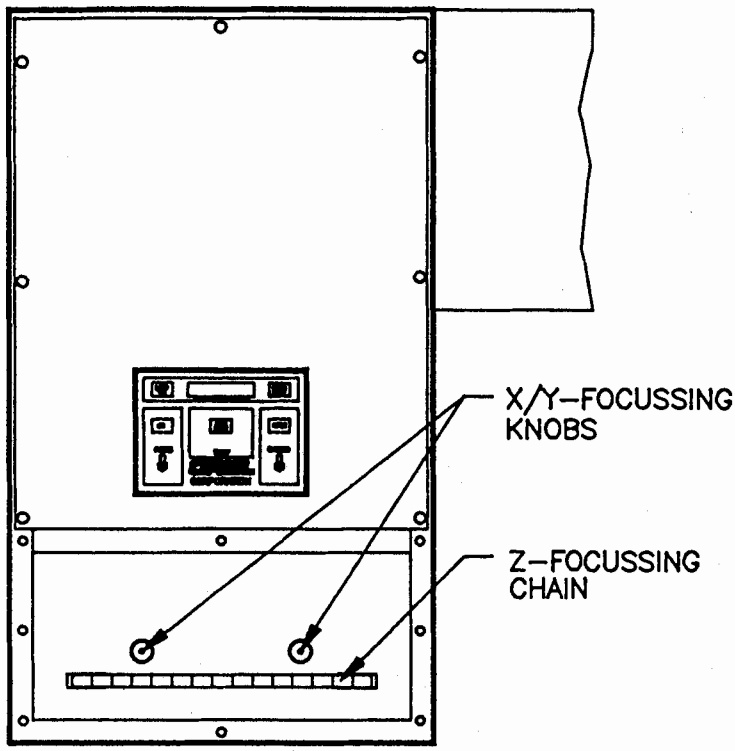


Fig.4.FOCUSSING THE LAMP
(STANDARD CONFIGURATION ILLUMINATOR)

INSTALLING SPECTRAL CORRECTION FILTERS

Oriel solar simulators are designed to accommodate a wide variety of spectral correction filters.

Following, is a list of our standard filter models. Custom filter solutions are also available. Contact our AEG sales department for other filter options

ORIEL AIR MASS FILTERS

All Oriel air mass filter sets consist of one, two or three filter elements. Each element is encased in a holder which has a corresponding mounting position in the illuminator housing. See Figure 5 for mounting positions.

AIR MASS 0 FILTER 81011

Corrects the output of a xenon arc lamp to better match the solar spectrum found outside the earths atmosphere. (ASTM E490-73a),i.e.to represent the solar irradiance at the absence of atmospheric attenuation.

When used alone, this heat removing filter will create the Air Mass 0 spectrum. This filter is also the "first" element for all other air mass filter sets.

WARNING: This filter is coated to remove much of the near IR irradiation of a xenon arc lamp. Therefore, the coated side (clearly marked) must face the lamp. This Filter must always be mounted when working with any of the other air mass filters which are vulnerable to intense IR irradiation, and may break if used independently.

Filter Placement: Model 81011 is mounted (see Fig.5.) between the optical integrator and the shutter assembly in the lenshousing.

AIR MASS 1 (DIRECT) FILTER:
CONSISTS OF 81011 AND 81074

Corrects the output of a xenon arc lamp to better match the solar spectrum at ground level when the sun is directly overhead.

Filter Placement: Model 81011 is mounted between the optical integrator and the shutter assembly. Model 81074 is mounted (see Fig.5.) in the rail assembly located beyond the shutter assembly.

AIR MASS 1.5 (DIRECT) FILTER:
CONSISTS OF 81011 AND 81075-

Corrects the output of a xenon arc lamp to simulate the direct solar spectrum when the sun is at a zenith angle of 48.2° (ASTM E891)

Filter Placement: Model 81011 is mounted between the optical integrator and the shutter assembly. Model 81075 is mounted (see Fig.5.) in the rail assembly located beyond the shutter assembly.

AIR MASS 2 (DIRECT) FILTER:
CONSISTS OF 81011 AND 81076

Corrects the output of a xenon arc lamp to approximate the solar spectrum when the sun is at a zenith angle of 60.1°

Filter Placement: Model 81011 is mounted between the optical integrator and the shutter assembly. Model 81076 is mounted (see Fig.5) in the rail assembly located beyond the shutter assembly.

AIR MASS 1.5 (GLOBAL) FILTER:
CONSISTS OF 81011, 81074 and 81080 for 2" x 2" beam size
or 81081 for 4" x 4" beam size
or 81082 for 6" x 6" beam size
or 81083 for 8" x 8" beam size

Corrects the output of a xenon arc lamp to better match the total (direct and diffuse) solar spectrum when the sun is at zenith angle of 48.2° (ASTM E892)

Filter Placement: Model 81011 is mounted between the optical integrator and shutter assembly. Model 81074 is mounted in the rail assembly located beyond the shutter assembly. Model 81080 and 81081 are mounted outside the lenshousing in the rail assembly located beyond the collimating lens. Model 81082 and 81083 are mounted inside the lenshousing in the rail assembly located beyond the 81074 filter(see Fig.5.).

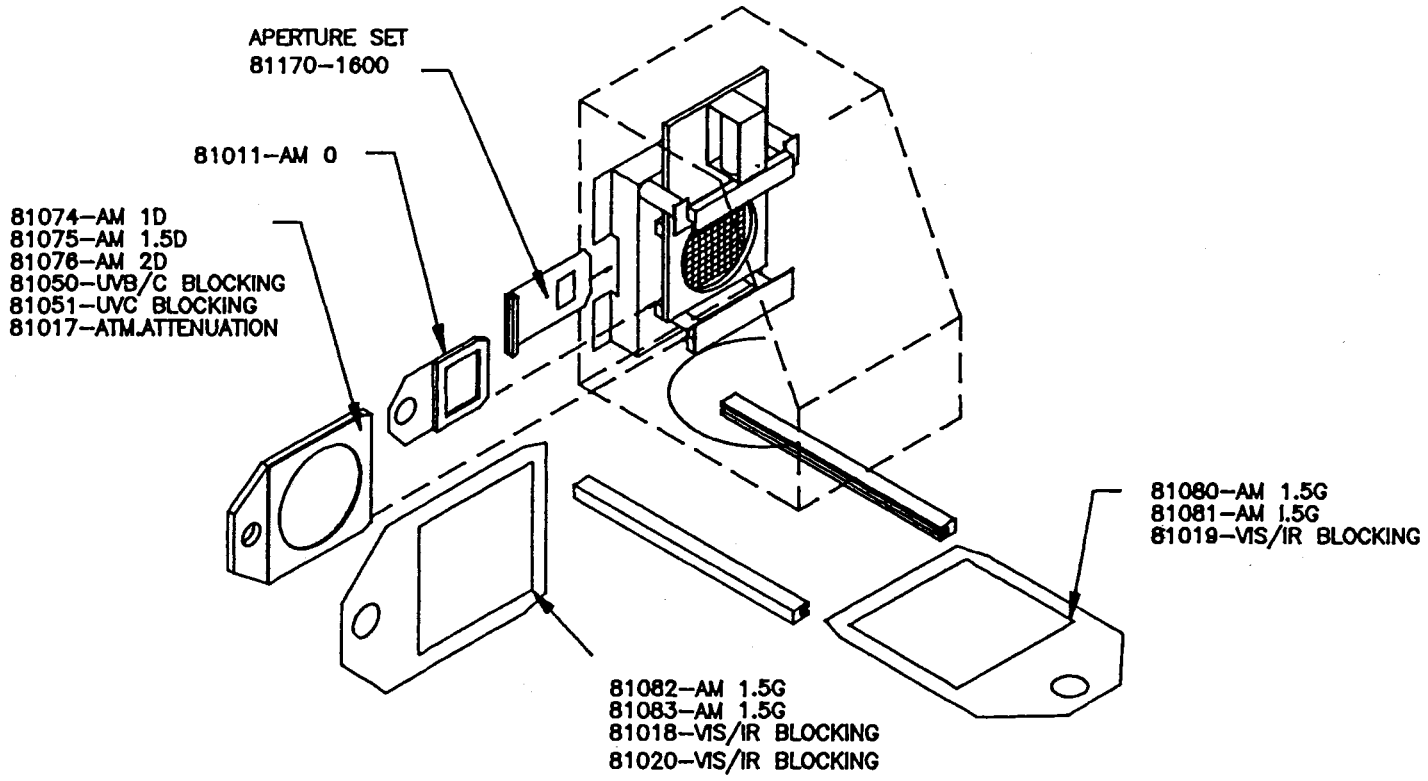


Fig.5.INSTALLING FILTERS

OPTIONAL BLOCKING FILTERS

Designed for use with Oriel Solar UV Simulators ONLY:

Each Oriel Solar UV Simulator includes a 280-400 nm (UVA/UVB) dichroic mirror which optimizes the UV output while filtering out most of the visible and infrared radiation. .Typical output of a Base Unit is within 280-400 nm plus residual 400-2800 nm (no additional filters necessary).

The following filters may be added to your Solar UV Simulator to further optimize the spectral output.

Atmospheric Attenuation Filter- typical output 290-400 nm plus Residual 400-2800 nm-Model 81017.

Filter Placement: Model 81017 is mounted in the rail assembly located beyond the shutter assembly (see figure 5).

Atmospheric Attenuation Filter plus **VIS-IR Bandpass Blocking Filter**-typical output 290-400 nm plus Residual 650-800 nm-consists of Model 81017 plus 81019 (for 4"x 4" beam), 81018 (for 6"x 6" beam), or 81020 (for 8"x 8" beam).

Note: not available for 2" x 2" beam.

Filter Placement: Model 81017 is mounted in the rail assembly located beyond the shutter assembly. Model 81019 is mounted outside the lenshousing in the rail assembly located beyond the collimating lens. Models 81018 and 81020 are mounted inside the lenshousing in the rail assembly located beyond the 81017 filter (see figure 5).

Warning: Model 81018, 81019, and 81020 VIS-IR Bandpass Blocking Filters absorb heat and should only be used with our Solar UV Simulators. If you wish to use these filters with our Solar Simulators contact our AEG Sales Department for necessary conversion mirrors.

UVC Blocking Filter - Model 81051 typical output 280-400 nm plus Residual 400-2800 nm.

Filter Placement: Model 81051 is mounted in the rail assembly located beyond the shutter assembly (see figure 5).

UVB/C Blocking Filter -Model 81050 typical output 320-400 nm plus Residual 400-2800 nm.

Filter Placement: Model 81050 is mounted in the rail assembly located beyond the shutter assembly.

For typical spectral output curves of Oriel Solar UV simulators utilizing these filters, please refer to page 49 of the Oriel Solar Simulator Product Guide(see a copy of this page in Appendix).

V. SOLAR SIMULATOR COMPONENTS

The housing contains the arc lamp, arc lamp ignitor, optical integrator, collimating optics, light shutter, and light shutter power supply. It is equipped with a safety interlock and a thermal interlock system to ensure operator and system safety. Integral fans and filter blower provide forced air cooling to ensure optimal lamp, optics, and housing temperatures.

1000 WATT XENON ARC LAMP

This high pressure short arc lamp is available in ozone free and UV enhanced models. The 1000 Watt Solar Simulators come standard with an ozone free lamp-62710- which has negligible output below 260 nm. If you need the deep UV wavelengths, choose the 62690, UV enhanced lamp. (Note: read the Safety section before operation).

THE HIGH VOLTAGE IGNITOR

To improve lamp start reliability and reduce E.M.I., we built the high voltage ignitor into the lamp housing. This reliable ignitor generates high voltage pulses to start the lamp(see Chapter LAMP IGNITOR for detailed description).

DIGITAL CONTROL PANEL

A variety of features lets you conveniently monitor and control the operation of the 1000 Watt Solar Simulator from the Digital Control Panel (Fig.2a). It is visibly located on the side of the lamp housing and contains :

1. Power On/Off Switch

This "POWER" toggle switch turns on and shuts down the housing operation. The light indicator above the switch shows when housing is activated (the lamp will not ignite with the switch in "OFF"-down-position).

2. Digital Elapsed Time Indicator

A digital display indicator -"LAMP OPERATING HOURS"- provides a convenient way to monitor lamp aging. Elapsed time is recorded in 0.1 hour increments up to 10,000 hours. This indicator can be reset when the lamp is replaced (see HOW TO RESET THE ELAPSED TIME INDICATOR). It also can be preset to match the recommended lamp life or the illuminator housing elapsed time which is important for conducting proper maintenance. Coupled with the Digital Elapsed Time Indicator LAMP ON light shows that lamp is ignited.

Note: Xenon arc lamps should be replaced every 900 hours to ensure optimum performance and to avoid catastrophic lamp failure.

3. "CHANGE LAMP" Indicator

After the designated time has elapsed, a red light labeled "CHANGE LAMP" reminds you to replace the lamp.

4. Fault Indicator

A red light labeled "INTERLOCK" provides a visual warning that a housing interlock system is "OPEN". The entire system automatically shuts down when this occurs.

5. Light Shutter Switch

This electronic "SHUTTER" switch opens and closes the splitblade light shutter, as needed. Indicator "OPEN" is lit when shutter is activated.

OPTICAL SYSTEM

An ellipsoidal reflector (Fig.6.) surrounds the lamp and collects over 70% of the lamp output. The radiation is focused via the primary deflecting mirror onto an optical integrator which produces a uniform diverging beam. This beam is deflected 90° by the 2nd mirror to a final collimating lens. The output is a uniform collimated beam.

We offer 4 different collimated output beam assemblies. These produce a 2 x 2 inch (51 x 51 mm), 4 x 4 inch (102 x 102 mm), 6 x 6 inch (152 x 152 mm), or 8 x 8 inch (203 x 203 mm) collimated beam. Each unit is laser aligned to ensure optimal beam uniformity, collimation and intensity. In addition, we offer the 1000 Watt Diverging Beam Solar Simulator which produces diverging output beam up to 12 x 12 inches (305 x 305 mm).

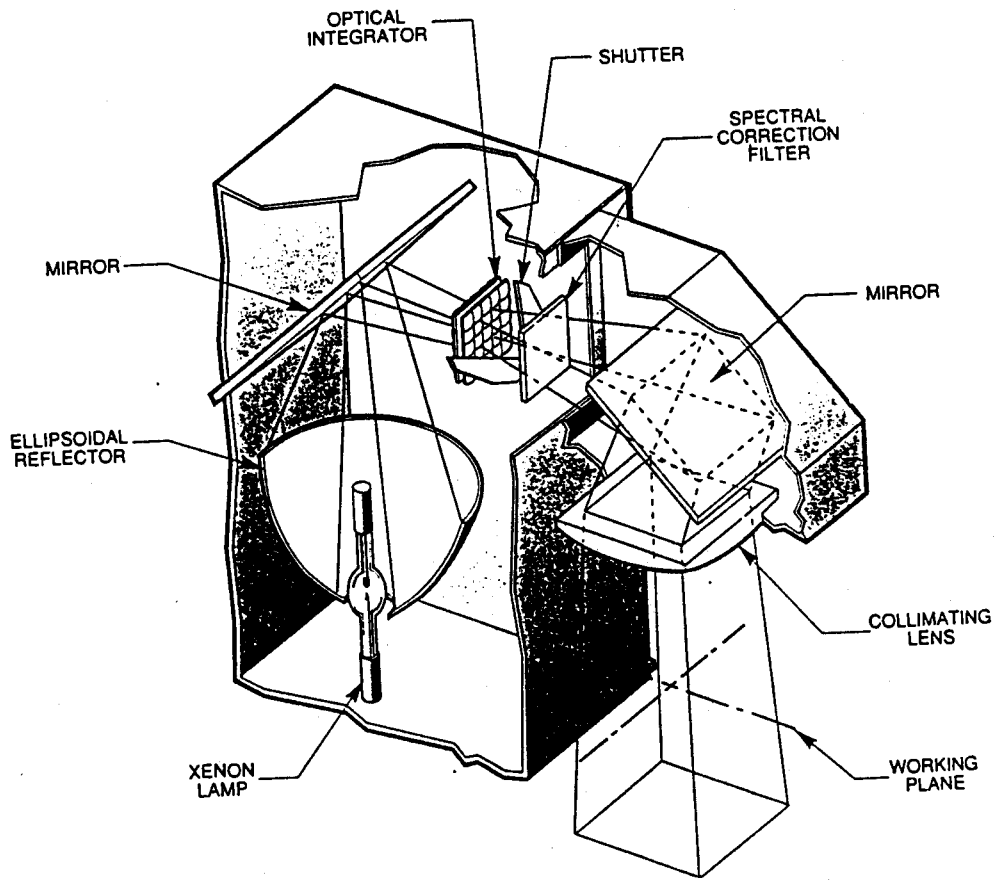


Fig.6 ORIEL SOLAR SIMULATOR OPTICS

MANUAL OR AUTOMATED EXPOSURE CONTROL

An electronic splitblade shutter is an integral part of each Oriel Solar Simulator. In addition to the switch on the digital front panel, you can control the shutter from a hand held switch, or via a contact closure. For computer control, logic level input is required.

For automated exposure control our 84350 Digital Timer and our 68851 Light Intensity Controller are available. The digital timer lets you present the exposure dosage needed to meet your requirements. For long term exposures, we recommend the light intensity controller. This intensity control system maintains a constant level of light regardless of lamp aging or changes in ambient temperature.

SAFETY INTERLOCK SYSTEM

The illuminator housing includes three safety interlock systems. Opening the housing door triggers the electrical interlock to automatically shut down the system. This prevents inadvertent operator exposure to the lamp. A thermal interlock shuts down the system if the temperature within the housing exceeds the level required for safe operation. A third interlock shuts off the lamp if the fan or blower fail.

VI. SOLAR SIMULATOR MAINTENANCE

LAMP REPLACEMENT

Reminder: Wear eye and skin protection!

1. Turn the power supply off.

2. Turn off the "POWER" switch located on the illuminator digital control panel.

3. Unplug the AC cord from the rear panel of the illuminator housing.

4. Remove the lamp access panel from the illuminator housing, Note: if you disconnect the "J201" connector from the rear of the digital control panel, be sure to note how to replace it. It will not function properly, and could in fact cause an electrical failure if it is reconnected backwards or incorrectly.

5. Loosen the two #6-32 set screws on the lamp heat sink, and remove the high voltage lead. (see figure 1a or 1b)

6. Hold the heatsink and carefully turn it counterclockwise to unscrew the lamp. Remove the lamp and heatsink from the housing.

7. Loosen the two #10-32 set screws on the heatsink. Remove the heatsink from the lamp.

8. Loosen the two #6-32 set screws from the brass threaded adapter (located on the opposite end cap of the lamp) and remove it from the lamp.

9. Observe the optical surfaces inside the illuminator housing. Each surface should be dust and dirt free and highly reflective.

10. To install a new lamp, refer to section " INSTALLING THE LAMP".

HOW TO RESET THE ELAPSED TIMER

As described in section V, the digital control panel contains an "ELAPSED TIME" and "CHANGE LAMP" indicator which provide a convenient and safe method to monitor important criteria in your solar simulator.

ELAPSED TIME

The elapsed time indicator has been factory programmed to count in .1 hour increments from .1 to 9,999.9 hours, at which time it will return to 0 hours. It has also been programmed to activate the "CHANGE LAMP" indicator every 900 hours. If you wish, you may reprogram the "CHANGE LAMP" indicator to activate in any hundred or thousand interval from 100 to 9990 by repositioning the jumpers located on the back of the digital control panel. See figure 7.

To reprogram the cycle time of the "CHANGE LAMP" indicator

1. Select *hundreds* or *thousands* by positioning the jumper on the "T and H" switch. Example: with the jumper plugged into "H" and the center pin you can set the indicator to activate between 1001 and 1000 hours. See figure 7.

2. Select the actual activation time by positioning the jumper on the "HOURS" switches. Example: with the jumper plugged into "9" and the center pin, and the former jumper positioned on "H" and the center pin, the "CHANGE LAMP indicator will activate every 900 hours. See figure 7.

Resetting the "ELAPSED TIME" and "CHANGE LAMP" indicators

A reset switch, located next to the "LAMP INDICATOR" switches on the back side of the digital control panel, permits you to reset the "CHANGE LAMP indicator independently, or together with the "ELAPSED TIME" indicator. A jumper located next to the reset switch, can be positioned to "ALL" which permits you to reset both the "CHANGE LAMP" and the "ELAPSED TIME" indicators, or to "LAMP" which permits you to reset only the "CHANGE LAMP" indicator.

SUGGESTION

We recommend positioning the jumper on "LAMP" so that the elapsed time indicator will continue to tally system hours. This is useful information for preventive maintenance. Regular preventive maintenance will help avoid system down time, and assure that your solar simulator maintains "LIKE NEW" performance.

REPLACING THE ELLIPSOIDAL REFLECTOR ASSEMBLY (see figure 8)

Reminder: Wear eye and skin protection

1. Turn the power supply off

2. Turn off the "POWER" switch located on the illuminator digital control panel

3. Unplug the AC line cord from the rear panel of the illuminator housing

4. Remove the lamp access panel from the illuminator housing

5. Remove the lamp. See section "LAMP REPLACEMENT" for proper instructions

6. Disconnect the high voltage cable and flying lead from the ceramic standoff located in the rear on the reflector mounting plate. (see (2) on figure 8)

7. Remove screws (3) inside the housing and (4) outside the housing

8. Carefully tilt the ellipsoidal reflector towards the primary folding mirror and lift it up and out of the illuminator housing. Be careful to avoid contacting the reflector with the primary mirror to prevent scratching the optical coating

9. Unwrap the new ellipsoidal reflector and inspect the optical surface. Remove any dust using compressed air

10. Remove the ceramic standoff from the old reflector mounting plate and attach it to the new plate

11. Insert the new ellipsidal reflector assembly into the illuminator housing and fasten it with screws (3) and (4) see figure 8

12. Reattach the high voltage and flying lamp leads to the ceramic standoff

13. Replace the lamp and lamp access cover

REPLACING THE 2nd FOLDING MIRROR

The 2nd folding mirror located in the mirror housing above the collimating lens.

1. Locate the mirror holding clamps (1) - see Fig. 9.

2. Follow steps 1 to 6 as instructed in section REPLACING THE 1st FOLDING MIRROR above.

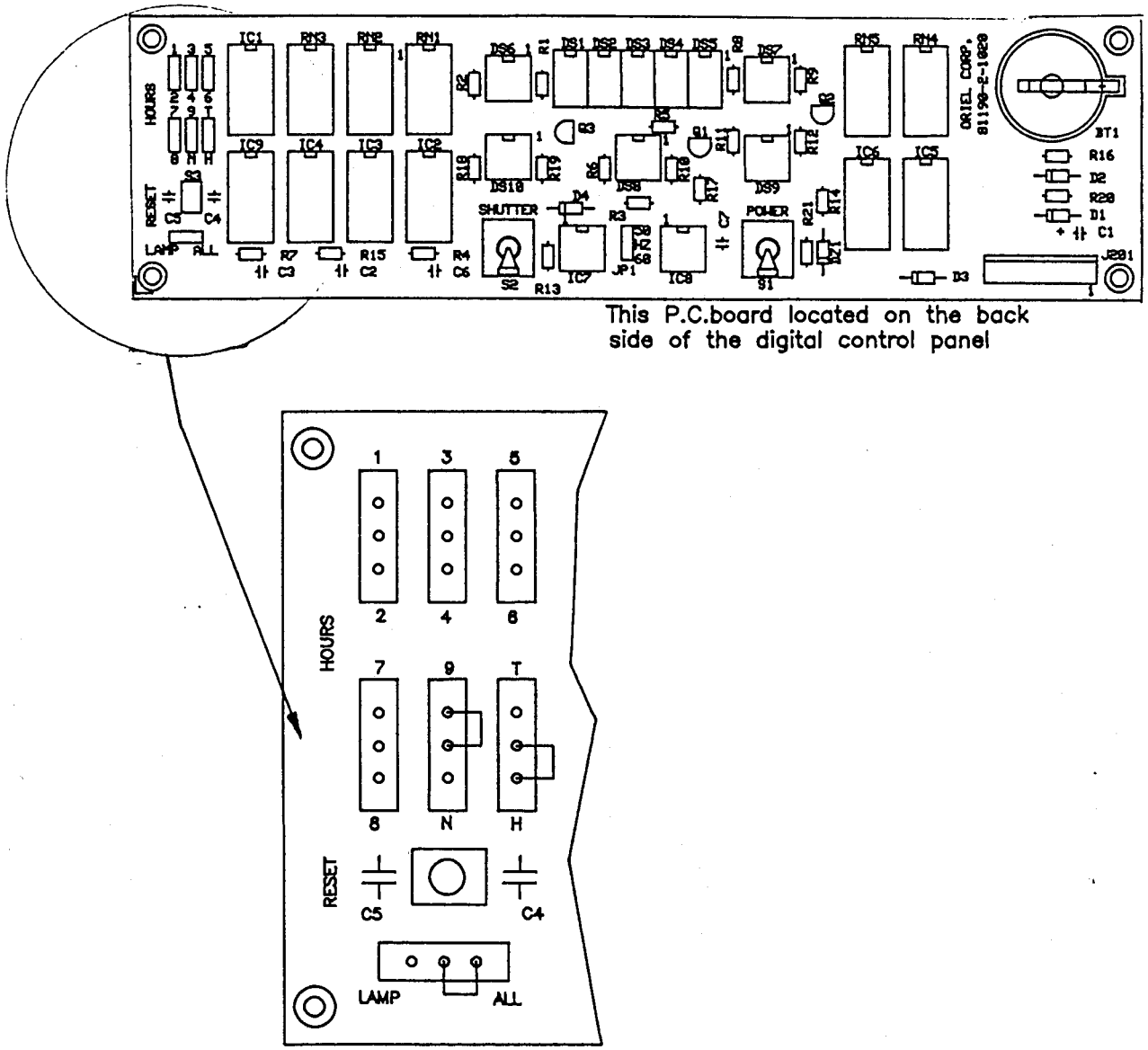


Fig.7.ELAPSED TIME INDICATOR RESET

REPLACING THE PRIMARY FOLDING MIRROR (see figure 8)

Reminder: Wear eye and skin protection

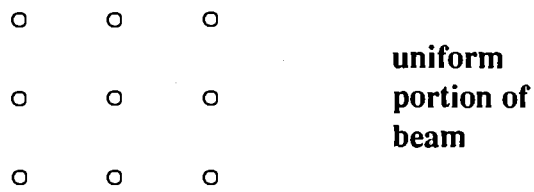
1. Turn the power supply off
2. Turn off the "POWER" switch located on the Illuminator digital control panel
3. Unplug the AC cord from the rear panel of the illuminator housing
4. Remove the lamp access panel from the illuminator housing
5. Remove the lamp. See section "LAMP REPLACEMENT" for proper instructions.
6. The primary mirror is secured to a prealigned mirror mount by four clamps, located in each corner. Loosen the two rear clamps using an "L" shaped 7/64 hex wrench (allen wrench) while securing the mirror with your free hand.
7. Remove the two front clamps
8. Slide the mirror away from the two rear loosened clamps and remove the mirror from the housing
9. Unwrap the new mirror and identify the coated side. An arrow on the side edge of the mirror points to the coated side
10. Insert the mirror and insert the back edge between the two rear clamps and fasten
11. Replace the front two clamps and fasten
12. Reinstall the lamp, follow in instructions in section "INSTALLING THE LAMP".

MEASURING BEAM UNIFORMITY

Your solar simulator has been optically aligned and optimized to produce a very uniform (+/- 5% or better) field of exposure. However, if you just replaced the lamp or ellipsoidal reflector, we recommend to check the beam uniformity and if its value >5% to readjust it. This readjustment may be necessary because of the tolerances of the arc and tolerances for the geometry of the ellipse. Mirrors replacing usually does not require uniformity readjustment. It also may happen that you wish for any other reasons to measure the actual beam uniformity of your system. Here is a step by step procedure we recommend to calculate the beam uniformity.

CAUTION these sources produce intense ultraviolet and visible light. Always wear protective eye, hand and skin wear when operating a solar simulator!

1. Place a template like the one pictured in Fig.10. under the center of the output lens, at the prescribed working distance. See the dimensional drawing to determine the recommended working distance for your system. The template should have nine evenly spaced measurement sights that fill the uniform portion of your solar simulator output beam



2. Using your radiometer and probe, measure the intensity level at the nine sights.

3. Once you have measured the nine points, use the following calculation to determine the beam uniformity.

$$\frac{(MAX - MIN)}{\frac{(MAX + MIN)}{2}} \times 100 = \%$$

Oriel solar simulators produce beams that are uniform to within $\pm$ 5%. If your system does not meet this specification, readjust or optimize the beam uniformity.

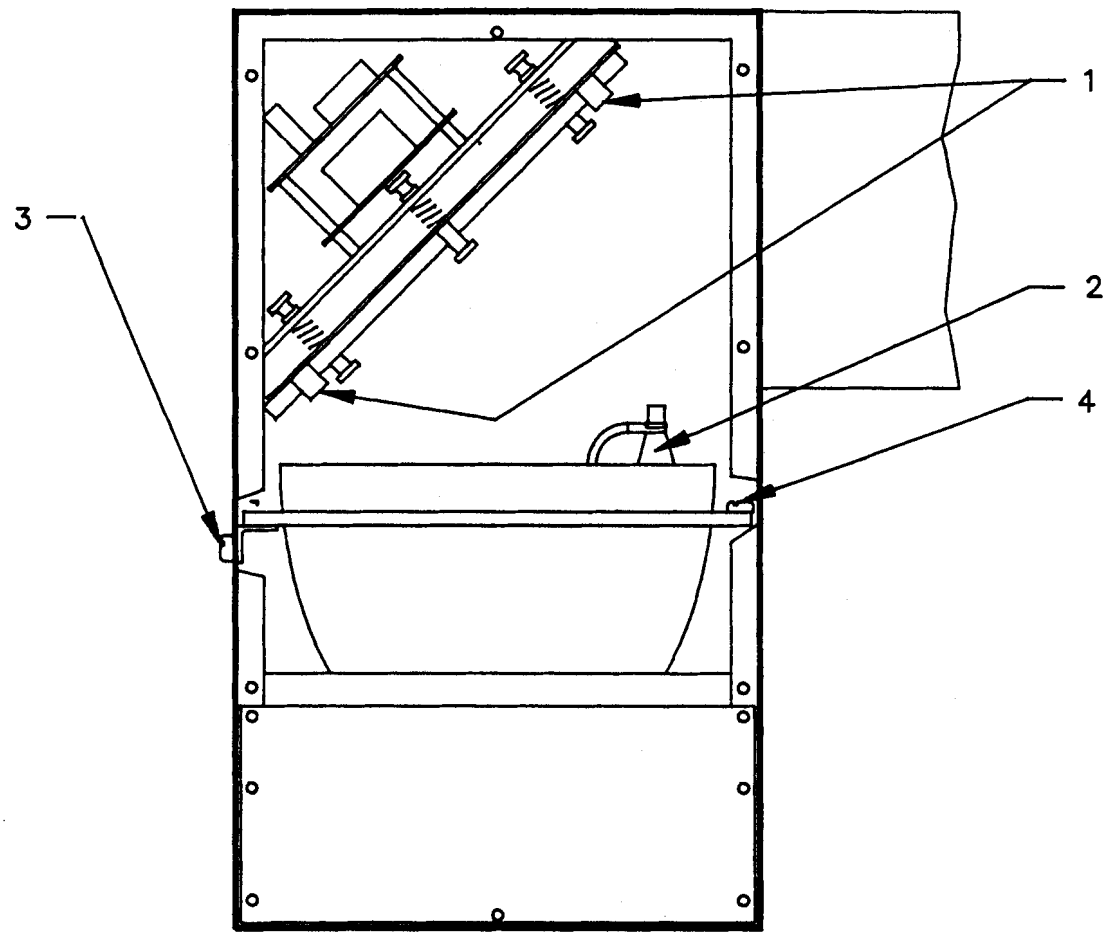


Fig.8 REPLACING THE PRIMARY FOLDING MIRROR AND ELLIPSOIDAL REFLECTOR

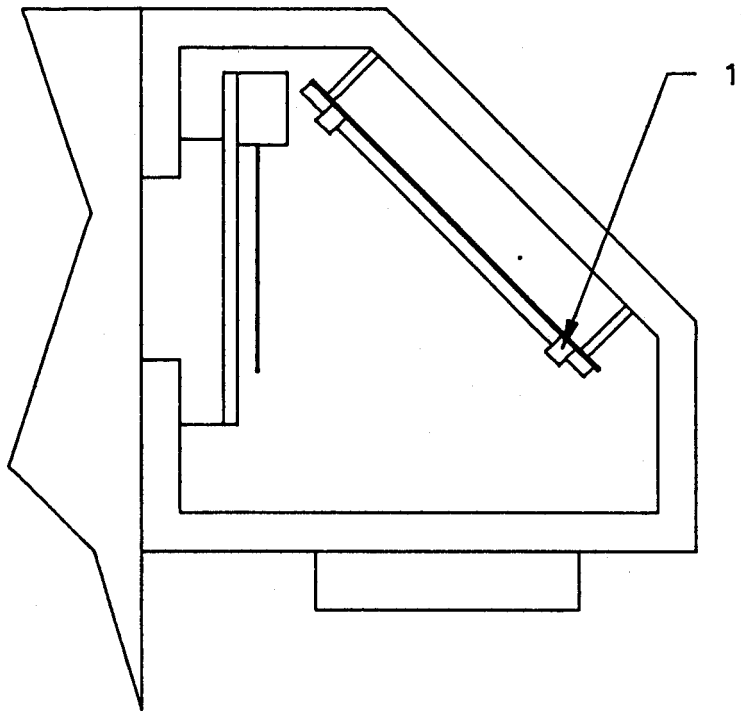


Fig.9.REPLACING THE 2nd MIRROR

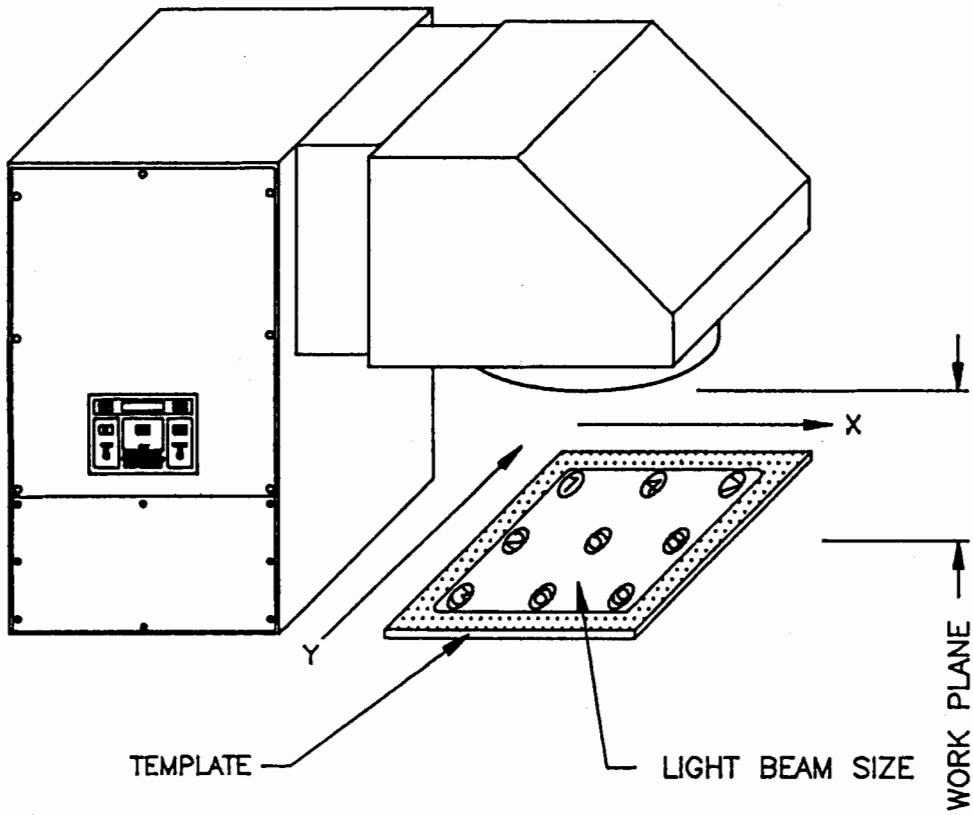


Fig.10 MEASURING THE BEAM UNIFORMITY

OPTIMIZING THE BEAM UNIFORMITY

Note: **Your solar simulator was optimized for beam uniformity before it was shipped to you. In most instances you will not need to optimize the beam uniformity.**

Reminder: **Wear protective goggles and gloves!**

1. Open the access cover of the mirror housing.

2. Open the shutter.

3. Measure the beam uniformity as instructed above and identify nonuniform sites in X-Y plane.

4. Adjust the vertical adjustment screw Y (Fig.11.) or horizontal adjustment screw X (start with the worst nonuniform plane) to equalize the power read on the light meter placed alternately in positions 1-2-3 and 7-8-9 or 1-4-7 and 3-6-9.

5. Repeat this adjustment in reverse order.

6. Repeat steps 4 and 5 with small adjustments for optimum.

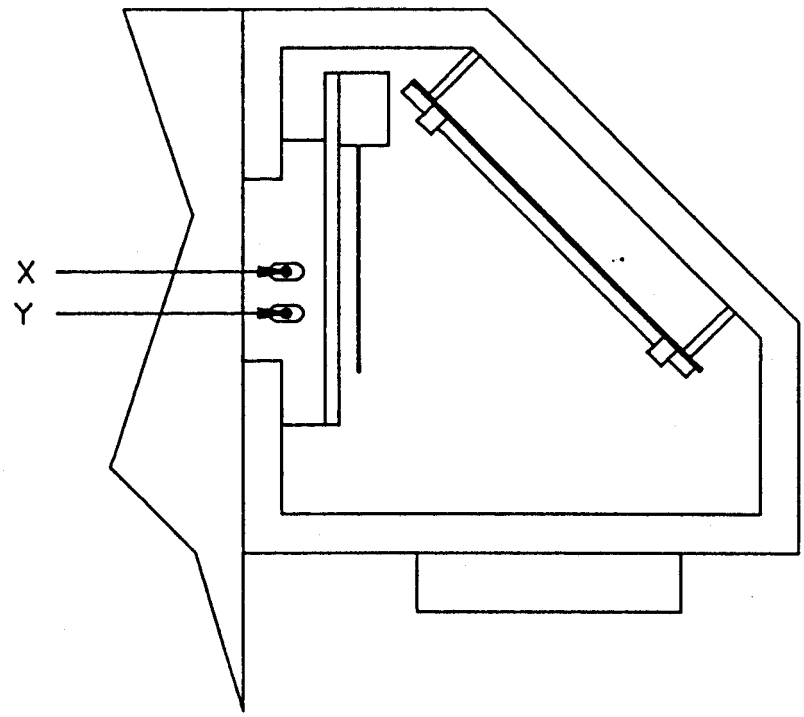


Fig.11 OPTIMIZING THE BEAM UNIFORMITY

VII. TROUBLESHOOTING

Before Troubleshooting this system read the **SAFETY** section at the start of this Manual.

PROBLEM	POSSIBLE CAUSE	HOW TO CORRECT
Lamp doesn't start		Make sure that"POWER" switch is ON and there is no "FAULT" indicator on the lamp housing front panel; lamp power is preset to 1000W+10%/-20%; open circuit voltage (approximately 70 VDC) is present on the power supply meter
	Incorrect cabling	Check cabling and fix
	Lamp not properly inserted	Follow lamp installation procedure carefully
	Bad or marginal lamp	Repeat ignition. Replace the lamp (make sure the lamp has starter wire)
	Insulation breakdown	Replace cables Consult ORIEL
	Interlock chain is not complete	Observe the "INTL"indicator on the front panel-it should ON. Turn the power supply off. Check interlock points one by one. Remove the interlock cable from back of the power supply and check for a short across the terminals of the interlock plug

PROBLEM	POSSIBLE CAUSE	HOW TO CORRECT
	Integrator lenses are damaged or dirty	Replace the integrator
	Mirrors or ellipse are damaged or dirty	Clean or replace
Lamp explosion	Defective lamp	Replace the lamp
	Lamp run too long	Replace the lamp after 900 hours irrespective of performance
	Incorrect lamp polarity	Make sure the new lamp installed correctly
	Lamp runs at too high wattage	Run the lamp at correct wattage only
Shutter doesn't open	Interlock chain is incomplete	Verify all switches are engaged; all covers are in place
	Power supply is not providing preiginition voltage	Check for proper power supply operation
	Shutter is damaged	Replace the shutter V

VIII. CLEANING THE SOLAR SIMULATOR OPTICS

The lamp housings of the Oriel 1000 Watt Solar Simulators are cooled by high velocity fans. An air cooled system means that dirt, grease, and other airborne contaminants are drawn into the illuminator housing and adhere to the optical surfaces within. (Note: Dirt and invisible films quickly degrade UV performance.) Depending on the cleanliness of your operating environment, we recommend you clean all optical components regularly to ensure maximum performance.

The 49160 ProClean Coating cleans uncoated and nonmetallic coated optics. Use it to clean air mass filters, light intensity controller filters, collimating lenses, or any other hard coated optic. (Use the Metallic Reflector Cleaning Fluid described on the right for metallic coated optics.)

1. **Brush On** - Pour ProClean in the center of the optic and use a soft bristle brush to evenly coat the surface. We recommend sable brushes.

2. **Let Cure** - Wait for the polymer to cure, about 15 minutes for small optics, or until the entire surface looks milky. Do not attempt to peel off ProClean until it is completely dry.

3. **Peel Off** - With an adhesive back label, peel off the coating. It peels away in one piece. (Note: To ensure maximum results and prevent breakage, use extreme care when peeling off the ProClean coating from the surface of an optic.)

The metallic ellipsoidal reflectors and large turning mirrors in our Solar Simulators are overcoated with S O for protection; however, special care is necessary during cleaning.

49122 Metallic Reflector Cleaning Fluid safely and effectively removes dust, dirt, and other surface particulates from these reflectors.

For safe, routine cleaning of the simulator overcoated metallic reflectors we recommend the Drag Wipe Method.

1. Remove large particles using an optical brush, dust bulb, or source of compressed air. Inspect to ensure complete removal of loose particles.

2. Drop one or two drops of our 49122 Cleaning Fluid directly on the reflector. Drape a clean piece of lens tissue on the wetted surface, and gently drag the tissue across the surface, pulling the wet-dry interface as you go. Repeat this step using a clean sheet of tissue each time, until the surface is clean.

NOTES :

- Do not us the Drag Wipe Method to remove large particulates. You will scratch the reflector as you drag the particulates across the surface.

- Do not drag wipe your reflector without wearing gloves or finger cots. Finger oils can transfer to the wet tissue and spread, contaminating the reflector.

- Do not reuse lens tissues.

- Do not set the reflector down on a dirty surface when you are finished.

IX. LAMP IGNITOR

INTRODUCTION

This unit contains the circuitry to generate a string of high voltage pulses in the 30-50 kV range for as long a period as the drive signal is received from the power supply.

Once ignition is complete, the unit is relatively transparent to the drive power from the power supply to the arc lamp. The ratings on the ignitor are 200 Vdc and 50 amperes.

This ignitor is located in the lamphousing, behind the 45° folding mirror.

SPECIFICATIONS

Input voltage	-	200 Vdc (maximum)
Throughput Current	-	50 amperes (maximum)
Input Drive	-	100V P/P, 20-25 kHz
Output	-	30 kV (minimum), split evenly between the two output lines.

SET UP

The only power required by the ignitor is supplied via the 3- conductor cable.

a) Connect the 3- conductor cable to the power supply rear panel connector J5 (ignitor drive)

b) Connect the other end to the mating female connector located on the rear panel of the lamp housing.

c) For set up and use of the power supply, refer to 68820 operators manual.

IGNITION OF ARC LAMPS

Starting Xenon Arc Lamps

This produces short high voltage spikes to cause electrical "break down" in the high pressure gas between the electrodes of the lamp. Electrical break down of this type has a random nature as what exactly happens depends on the availability of the few free electrons in the neutral gas when the ignitor applies the high field. Oriel power supplies sustain the filamentary arc caused by the ignitor and feed the growing arc into the stable DC phase. Failure to start a lamp can result from inability of the ignitor to cause electrical breakdown, inability of the power supply to provide adequate current and voltage in the initial growth phase, or inability of the DC section of the power supply to "take over" and maintain the arc. The power supply safety circuitry may sense the arc as a short and turn off.

FIRST LEVEL DIAGNOSTICS

If the lamp fails to ignite, then safe viewing of an image of the region between the electrodes can give useful diagnostic information. Safe viewing implies the arc lamp is safely confined and the electrode area or its image is viewed through UV safety glasses. For setting up an imaging plane you can illuminate the electrodes with a flashlamp from the side or rear, and image the electrodes onto a white card. Replace any safety cover on the lamp enclosure before proceeding.

If the ignitor is working properly then, you should see a weak blue flash. If only the thin blue striae appear, then check that the Oriel Power Supply open circuit voltage is present. If the second phase, the initial "current dump" is operating successfully then you should see a more intense white flash. Failure of the power supply to keep the arc going may be due to its safety circuitry operating to sensitively, or a major problem with the power electronics. You can check the DC operation with a high power resistor of similar impedance to an operating lamp load.

POTENTIAL EMI PROBLEMS

Xenon lamps require fast rising pulses of 25-40 kV to initiate the first electrical breakdown. Unfortunately electrical pulses of this type exhibit a very independent streak. Insulators with a high DC hold-off rating will not necessarily stop the high frequency pulses that can capacitively or sensitive electronics. You should take steps to shield and ground nearby systems, but bear in mind that fast pulses can transiently raise the potential of DC grounds. Oriel has invested considerable effort in high voltage generators worthy of Nikolai Tesla. Ignitors of this type wreck havoc with ICs, so we toned down our wonderful hash ignitor. We spent a long time designing our latest generation of ignitors for the optimum pulse shape for reliable ignition, and to allow cable shielding.

STARTER WIRES

In practice we find that ignition is more reliable for some lamps when a starter wire is used. Oriel lamps requiring a starter wire are shipped with it already attached. If you need to attach your own wire than be sure you do so with extreme care and cleanliness. Above all, do not connect the terminals of the lamp with the wire!

WHY THE IGNITOR MAY NOT WORK

Obviously it is possible that the ignitor may not be working. viewing the small spark gap in the ignitor will help you determine this.

Dissipation of the ignition pulse energy may weaken the pulse too much. You can feel a tingle from the pulses if you were to touch them during ignition. This tingle is harmless except possibly in the case of those with heart pacemakers; note that we do not know of any problems with pacemakers. The tingle obviously comes from the electrical pulse and so represents loss of ignition capability. Dissipation will depend on humidity. The cables from Oriel ignitors to the lamps are made with durable high insulators. (Note that capacitors that are transparent to high frequency pulses uses insulating materials between two conductors. When the cable lies on a conductor, the central wire in the cable, the cable insulation and the external conductor make a capacitor.)

High voltage pulses can also track surprising distances over surfaces sometimes converting organics (dirt or applied coatings) into conducting carbon to make future tracking easier. Sharp edges in the conduction path lead to very high fields and loss of energy through corona.

The actual energy in the pulse is quite small and enough can be lost at a pore electrical contact to make lamp ignition impossible.

If the ignitor is working but the lamp does not light, check

1. All contacts such as the ignitor cable-lamphousing socket.

2. The lamp has a starter wire if appropriate.

3. The lamp is intact and within its prescribed life. Lamps become harder to ignite as they age.

CIRCUIT DESCRIPTION (Reference Schematic 68860-3-1001)

The power supply outputs (+ and -) are connected to the (+ and -) lamp terminals on the rear panel of the lamp housing. The ignitor creates a high voltage pulse (20 kV) on each lamp lead. The pulses are of opposing polarity, yielding a differential voltage across the lamp of 40kV, which caused the lamp to breakdown.

The signal from the ignitor drive (a nominal 100 Vp-p, 25 kHz square wave) is rectified (D11, L1, R3, C13) and then regulated (LM340T24, C12) to 24 Vdc which drives the inverter, stepping the voltage up to 1200 Vrms, 30 kHz. The high voltage multiplier charges up the capacitors (C10, C11) until the spark gap (SC) breaks down, dumping the energy stored in those capacitors, limited only by R2, into the primary winding of T1 which, in turn, couples this energy onto the lamp leads.

TROUBLESHOOTING

Repairs or internal adjustments to this equipment should only be attempted by an experienced electronic technician. Improper use of test equipment or tools can easily damage components within the unit or compound existing problems.

< < < < < WARNING > > > > >

POTENTIALLY LETHAL VOLTAGE LEVELS EXIST WITHIN THIS UNIT WHEN POWER IS APPLIED - AND FOR MANY MINUTES AFTER POWER HAS BEEN REMOVED. EXTREME CARE SHOULD BE TAKEN WHEN WORKING WITH THIS UNIT.

If trouble is encountered, the front and or rear panel of the lamphousing should be removed and a visual inspection made for shorts, broken wires and obviously damaged or broken components.

If there is no obvious problems, listed below are some items to check, with expected results.

a. Push the lamp start button on the power supply and check for lamp breakdown. There is no need to look directly at the lamp to make this determination as there will be adequate light exiting the housing if the breakdown is occurring.

   WARNING: Never look directly into the output beam of a housing or at a specular (mirror) reflection of a beam, even for short periods, when operating - or trying to ignite - a lamp.

   If there is a flash from the housing coincident with the snap of the ignitor spark gap firing, the ignitor is functioning properly and the problem lies either with the power supply or the lamp itself.

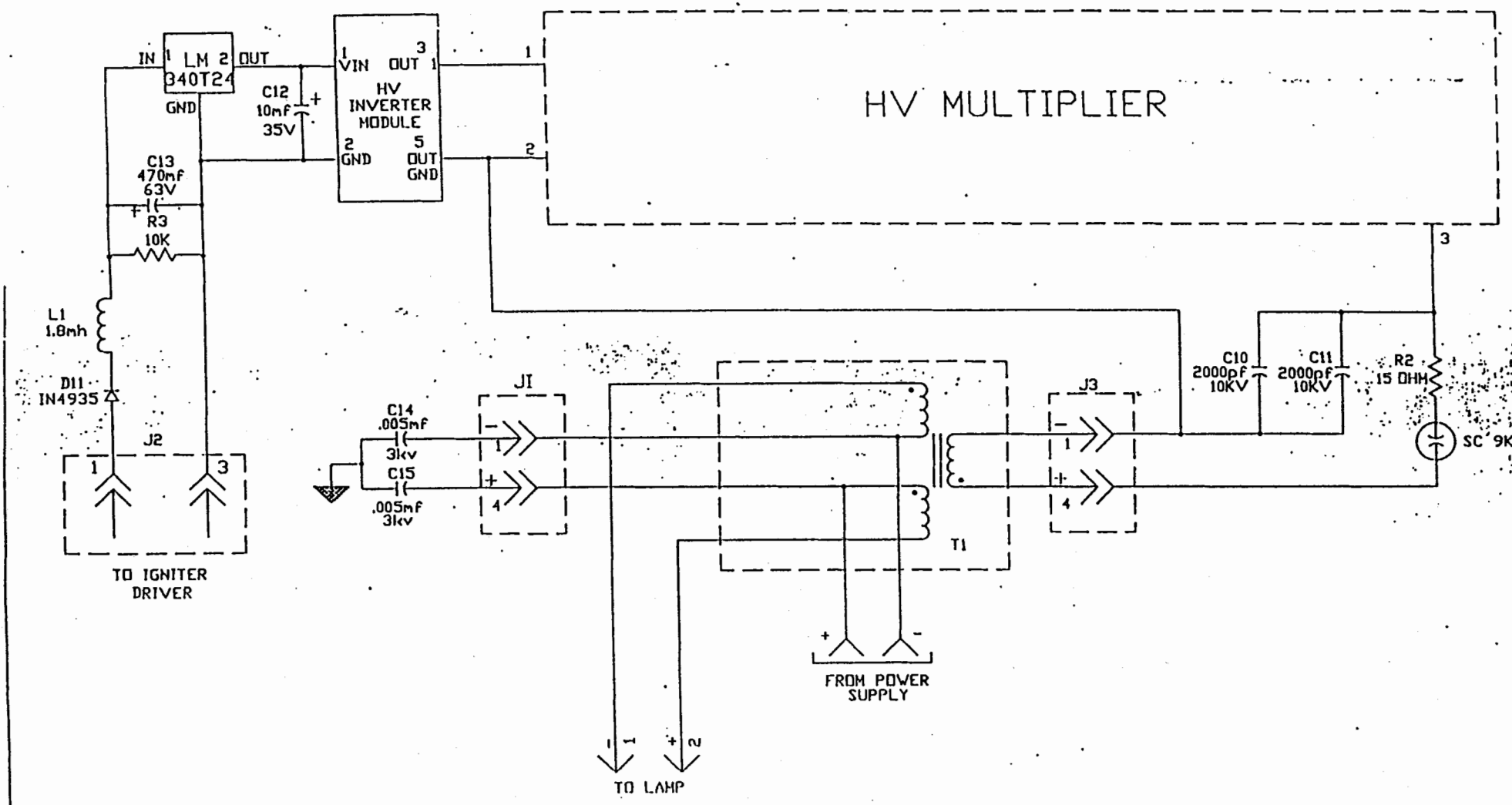
b. If the lamp is not flashing, verify that the spark gap in the ignitor is firing at a regular rate, about once a second, while the lamp start button is pushed. If the spark gap is breaking dow, the problem is most likely with the lamp, the wiring from the ignitor to the lamp or the transformer, T1, in the ignitor.

c. Check for Ignitor Drive from the arc lamp power supply. Connect an oscilloscope from the anode of D11 to the ground side or R3 (furthest from D11). There should be a minimum of 100 Vac @ 25 kHz for several seconds after the power supply LAMP START switch has been pressed and released. If the 100Vac @ 25 kHz is not present, check for bad interconnect wiring or a bad ignitor drive in the arc lamp power supply.

d. Measure between VIN and GND terminals on the inverter module to verify +24 Vdc. Improper input voltage implies bad 24 volt regulator or bad rectifier component (D11, L1, C13).

e. If high voltage measuring equipment is available, the output of the inverter can be measured. Caution must be taken that your measuring equipment will not be damaged by the output voltage. With the lamp start button pushed, there should be a sinusoidal voltage waveform, about 1200 Vrms (3500 V peak to peak) @ 30 kHz, between the terminals OUT1 and OUTGND on the inverter module. Significant discrepancy indicates bad inverter module.

f. If all the above tests are satisfactory, the indication is that the encapsulated high voltage multiplier module is defective.



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DO NOT SCALE DRAWING	L. WATSON	UNIVERSAL ARC LAMP IGNITOR
		68060-3-1001

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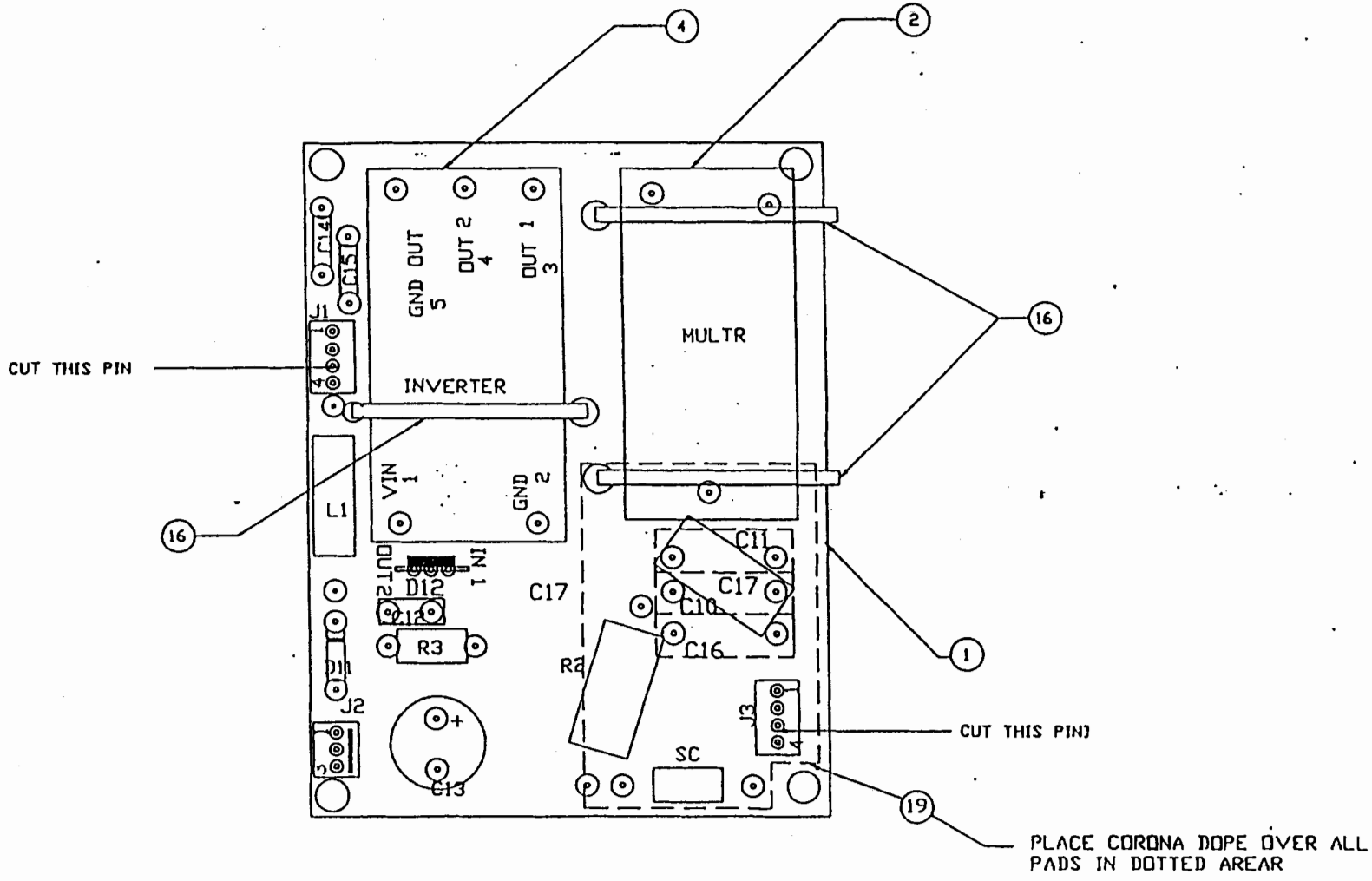

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SHARP CORNERS TO BE BREAK AND REMOVE ALL BURRS PARTS MUST BE CLEANED FREE OF OILS GRIT GREASE OIL ETC		SCALE	

UNLESS OTHERWISE SPECIFIED THIS PART MUST BE FREE OF HEAVY MACHINING AND EXTRUSION MARKS, BOSSES MOLD AND DENTS BREAK ALL SHARP CORNERS AND RE-MOVE ALL BURRS PARTS MUST BE CLEANED FREE OF OILS GRIT GREASE OIL ETC

X. *THE POWER SUPPLY*

The Oriel Model 68820 is one of a series of constant wattage switched-mode arc lamp supplies. Its intended use is to operate 400 to 1000 watt arc lamps whose operating voltage and current ranges are between 15 - 40 volts and 20 - 50 amperes such as the following arc lamps.

Typical Operating Characteristics of Arc Lamps
Suitable for Use With the 68820 Arc Lamp Power Supply

Wattage & Type	Oriel Model #	Equivalent to	Voltage	Current
Xenon Arc Lamps:				
450 Xe	6261	OSRAM XBO 450W	18	25
UV450 Xe	6262	OSRAM XBO 450W/4	18	25
500 Xe	6265	Hanovia 959-C98	14-20	25-35
1000 Xe	6269	Hanovia 976-C1	23	44
Mercury and Mercury-Xenon Arc Lamps:				
1000 HgXe	6239	Hanovia 977-B1	30-38	26-33
1000 HgXe(OF)	6295	Hanovia L5173	30-38	26-33
1000 Hg	6287	USHIO ISH-1005D	30-38	26-33

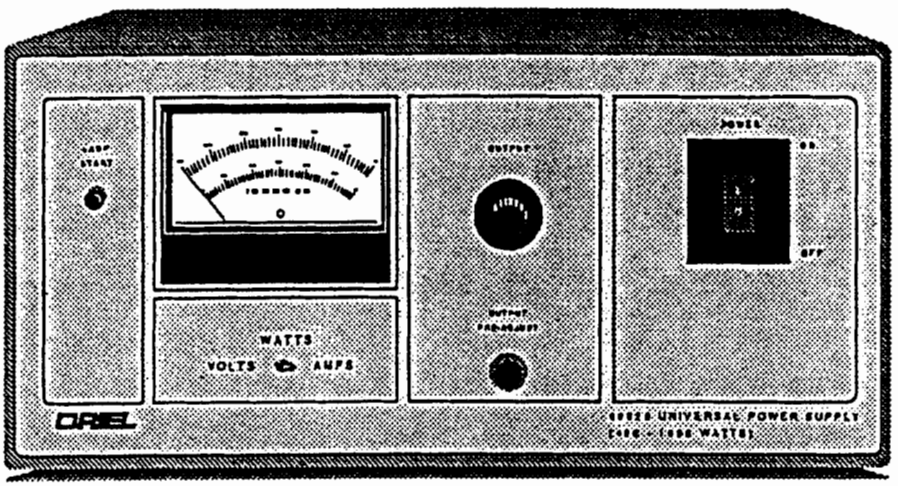
TABLE I.1

The power converters in these units are switched at a relatively high frequency (20 - 25 kHz). This technique yields several advantages. The high frequency ripple is easier to filter, the power components (transistor and choke) are smaller and lighter and efficiency is greatly improved. Also, the high frequency transient response is improved allowing for externally controlled lamp intensity modulation.

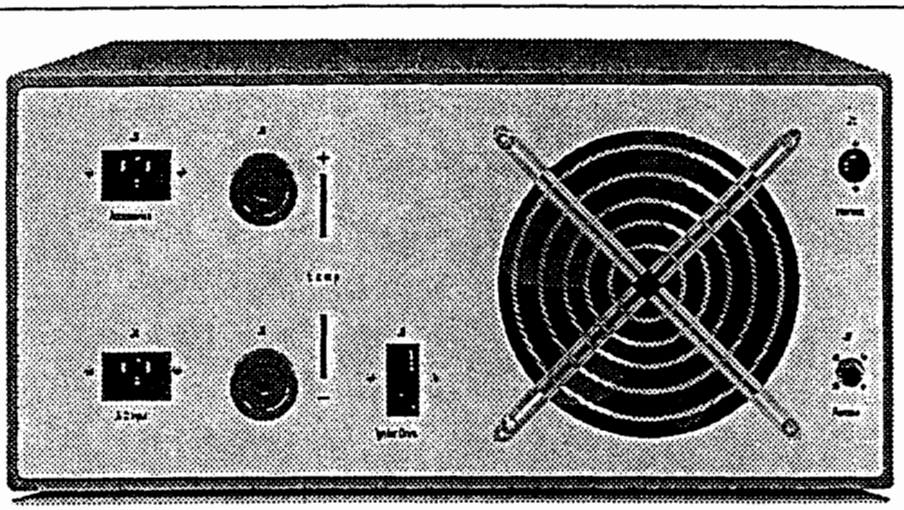
The list of features for these units is extensive, including such items as:

- Operation from 190 - 260 VAC, 50/60 Hz.
- Setting of lamp power prior to ignition
- Output regulation on lamp power (voltage x current)
- Direct power metering with voltage and current reading available on demand
- Photofeedback option available
- Remote metering signals are available at a rear panel connector

The packaging of this supply was done with ease of maintenance in mind. With the exception of large power components, all circuitry is located on three easily removable printed circuit cards. All internal calibration potentiometers are located at the left of the unit and are readily accessible with the top cover removed.



Front Panel of 68820 Universal Power Supply.



Rear panel of 68820 Universal Power Supply.

II. SPECIFICATIONS

AC Power Input	190 - 260 VAC, 50/60 Hz.
DC Power Output	1200 watts maximum, 50 amperes maximum
Light Ripple (50/60 Hz)	< 1.0% P-P Typical
Pre-adjust Accuracy	± 2%
Power Meter Accuracy	± 1%
Stability (after 10 minute warm-up	± 0.2%
Line Regulation	± 1.0% (over total voltage excursion)
Output Current Limit	55 amperes (± 1.0)
Output Voltage	Pre-ignition, 70 VDC minimum (unloaded); 40 VDC maximum (loaded)
Boost Voltage	150 - 200 volts, applied only on lamp start

III. CONTROLS AND FUNCTIONS

FRONT PANEL

Output Pre-adjust Switch	Momentary pushbutton switch. When depressed causes the meter to display lamp power setting prior to ignition.
Meter	Has three scales - Watts, Amperes and Volts
Watts/Volts/Amperes Switch	Three position toggle switch, spring-loaded to center position. In the center position causes the Meter to display lamp power. In the left position causes the Meter to display lamp voltage. In the right position causes the Meter to display lamp current.
Output Potentiometer	Ten turn potentiometer with friction lock. Sets lamp power.
Lamp Start Switch	Momentary push button switch. Used to ignite lamp. Ignition occurs when pressed.
Power Switch	Rocker switch. Used to apply power to the unit. Includes a "Power On" indicator lamp and the circuit breaker for the power supply.

REAR PANEL

J1-Interlock Connector
* Cinch/Jones #P302-CCT

Two pin connector for interlock cable from the lamp housing

J2-Remote Connector
* Viking # TKP12-103

Pin	
1	Photofeedback Control Input (12 volts max.)
2	Reference (Buffered Output Control setting) output
3	Common (ground)
4	N/C
5	117 VAC output (non-isolated)
6	N/C
7	117 VAC output (non-isolated)
8	N/C
9	Remote Meter Power Output
10	Remote Meter Current Output
11	Remote Meter Voltage Output
12	Remote Meter Common Output

J4-AC Input Connector

Three pin (grounded) power input connector

J5-Ignitor Drive Connector
* Cinch/Jones #P303-CCT

Three pin (grounded) connector providing 100V P/P, 35kHz ignitor drive signals for time that the start switch is pressed

J6-Lamp + Connector
*Amphenol

One pin connector providing positive voltage to the lamp anode

J7-Lamp - Connector
*Amphenol #PL-259

One pin connector providing negative voltage to the lamp cathode. This is a grounded output.

IV. SET-UP AND USE

SAFETY

There are two major areas of concern pertaining to personal safety when using this piece of equipment. The first has to do with the power supply itself and the second has to do with the lamp powered by the supply.

POWER SUPPLY

The common, or minus, side of the power supply output is connected to earth ground at a single chassis ground point. It is undesirable for the + lamp output connection to come in contact with any other ground reference or especially any person. As long as the power supply is turned on there will be DC voltage across the lamp output connectors (J6 and J7) in excess of 70 volts when the lamp is not ignited. When the unit is turned off, allow at least three minutes for the internal filter capacitors to discharge. This charge status may be monitored by the front panel meter.

The front panel wattmeter is accurate under load conditions and should have no offset errors. The specification for accuracy is ± 1%. The output Pre-adjust accuracy is ± 2%.

When pre-ignition output voltage is present, however, there may be some offset present at the front panel meter. This offset which may be either positive or negative is caused by a large voltage signal into the power multiplier and by an ever so small (nominally zero) current signal at this time.

It is possible for this power supply to be used with a separate stand-alone ignitor (Oriel Model 68706) if the lamp housing does not have a built-in ignitor. In this case an additional danger exists at the output of the ignitor. During ignition, one or more high voltage pulses will be generated at a level of 20 - 30 kV. This output could, under certain conditions, become lethal to any person coming in contact with it.

ARC LAMP

Because of the nature of the high pressure lamps used with this supply and because of the high degree of shortwave ultraviolet radiation produced, there are several precautions that should be observed while working with these lamps. They are:

a. Read and become thoroughly familiar with any manufacturer's information supplied with individual lamps.

b. Do not look at any direct, specular (mirror) or diffuse reflections of the lamp's output beam, even for short periods of time, without the use of protective glasses or goggles.

c. Wear appropriate goggles or other protective devices when directly observing illuminated lamps.

d. Handle the lamps with extreme care. Avoid fingerprints or other contaminants which could weaken the quartz envelope.

IF OZONE FREE LAMPS ARE NOT USED, PROVIDE ENOUGH VENTILATION TO PREVENT OZONE BUILD-UP.

INSTALLATION

Installation of the 68820 is straightforward and should not present any particular problem. *BE CERTAIN NOT TO BLOCK THE AIR EXHAUST PORTS AT THE SIDES OR THE AIR INTAKE FAN AT THE REAR OF THE UNIT.*

The two-wire safety interlock cable from the lamp housing should be connected to J1 on the rear panel. If the lamp housing does not have a safety interlock cable, a jumper connector must be plugged in at J1 or the power supply will not generate an output.

Note: If the interlock system is open, the **POWER** indicator will illuminate and the fan will be driven but no pre-ignition pulses will occur after depressing the LAMP START switch. There won't be any open circuit voltage present.

OPERATIONS

FOR XENON LAMPS

a. Turn on the front panel POWER switch. The POWER indicator should illuminate and the cooling fan should turn.

b. Before igniting, depress the OUTPUT PRE-ADJUST button and adjust the OUTPUT control for the desired lamp wattage as indicated on the meter. Push the meter switch to the VOLTS position and verify that a pre-ignition voltage of at least 70 volts is available.

c. Depress the LAMP START switch for several seconds. If you have the meter set to display volts, you should see the voltage rise when you press the LAMP START button. The voltage is boosted to 150V, though you may not see this value reached if the lamp ignites. The lamp should ignite and the lamp power should regulate at the Pre-adjust level (± 2%). Adjust the OUTPUT control for the proper output power to the arc lamp, if necessary.

d. If the lamp does not ignite immediately, repeat the ignition procedure. If the lamp does not ignite after a few attempts, see the end of this section.

FOR MERCURY (XENON) LAMPS

a. Turn on the front panel POWER switch. The POWER indicator should illuminate and the cooling fan should turn.

b. Before igniting, depress the OUTPUT PRE-ADJUST button and adjust the OUTPUT control for the desired lamp wattage as indicate on the meter. Push the meter switch to the VOLTS position and verify that a pre-ignition voltage of at least 70 volts is available.

c. Depress the LAMP START switch for several seconds. If you have the meter set to display volts, you should see the voltage rise when you press the LAMP START button. The voltage is boosted to 150V, though you may not see this value reached if the lamp ignites. The lamp should ignite and the lamp current should go immediately to the OVER-CURRENT limit.

d. Immediately after a proper ignition, the lamp power will be less than the pre-set wattage until the lamp begins to warm up. First the power will climb to the pre-set wattage and then the lamp current will slowly fall to its final value. Since the Output Pre-adjust is only accurate to ± 2%, it may be necessary to re-adjust the OUTPUT control for the proper output power to the arc lamp.

e. If the lamp does not ignite immediately, repeat the ignition procedure. If the lamp does not ignite after a few attempts, see the last paragraph in this section.

FOR MERCURY LAMPS

a. Turn on the front panel POWER switch. The POWER indicator should illuminate and the cooling fan should turn.

b. Before igniting, depress the OUTPUT PRE-ADJUST button and adjust the OUTPUT control for the desired lamp wattage as indicated on the meter. Push the meter switch to the VOLTS position and verify that a pre-ignition voltage of at least 70 volts is available.

c. Depress the LAMP START switch for several seconds. If you have the meter set to display volts, you should see the voltage rise when you press the LAMP START button. The voltage is boosted to 150V, though you may not see this value reached if the lamp ignites. The lamp should ignite and the lamp current should go immediately to the over-current limit.

d. Immediately after ignition the lamp power will be less than that selected in step b. As the lamp begins to warm up the voltage and power will rise, but current will remain at the limit until the Pre-adjust level (± 2%) is reached. At this point the power should hold constant and the lamp current should begin to fall at a fairly rapid rate.

Final lamp current is typically 27 amperes for Model 6287 (1000W).

e. If the lamp ignites but the lamp current does not fall to a reasonable value (or wattage does not climb to the pre-adjust level), check that there is not too much cooling on the lamp.

If the lamp does not ignite immediately, repeat the ignition procedure.

IF THE LAMP DOES NOT IGNITE AFTER A FEW ATTEMPTS, PLEASE CHECK THE FOLLOWING:

a. All lamp connections and connectors should be tight and of the correct polarity.

b. All exposed metal surfaces in electrical contact with either lamp terminal, such as support clamps, holders, terminal lugs, etc., should be at least 3/4 of an inch from any grounded metal surface to prevent arcing when the ignitor is in operation.

c. The LAMP START button must be pressed to apply power to the ignitor drive circuit.

V. CIRCUIT DESCRIPTION

OVERVIEW OF THE ORIEL MODEL 68820 ARC LAMP POWER SUPPLY

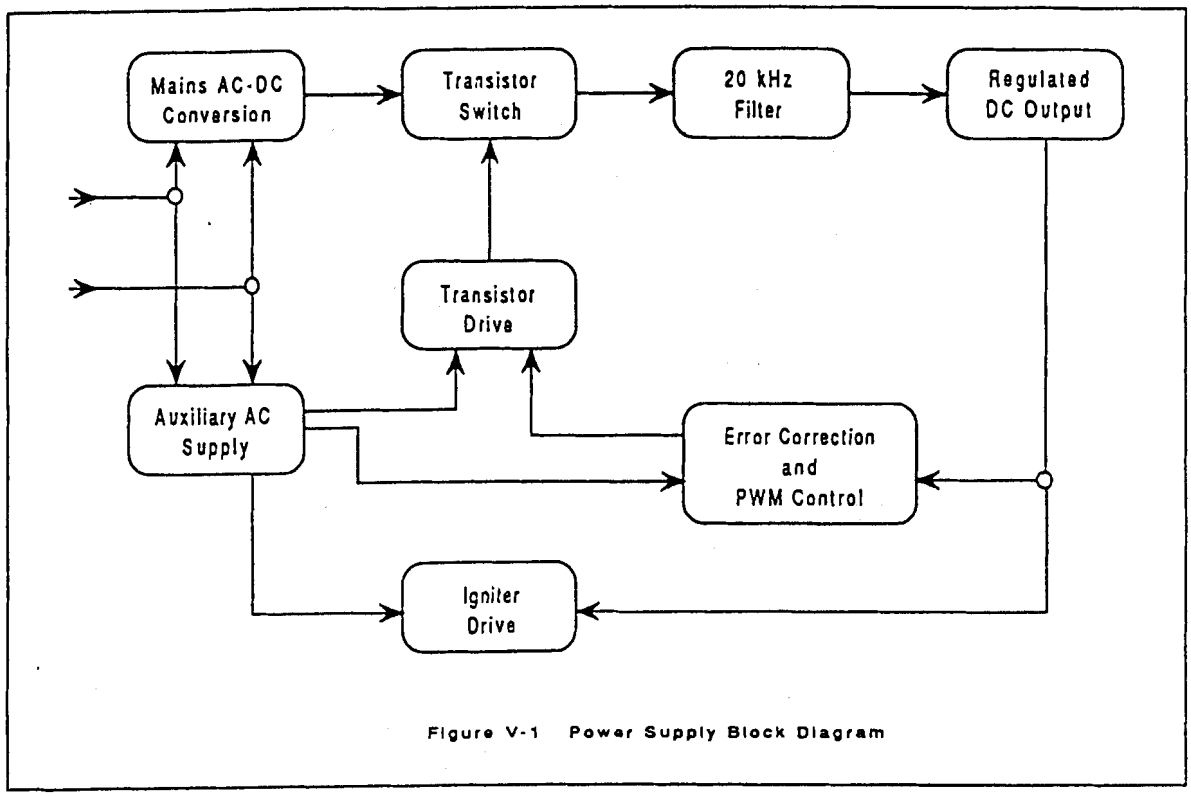


Figure V-1 Power Supply Block Diagram

The Oriel Model 68820 Power Supply is a DC-DC converter. It is a step down switching regulator operating at 20 kHz. Please refer to Figure V.1 for the block diagram of this supply.

The input mains voltage is transformer coupled, rectified to produce pulsating DC and filtered. The PWM then turns the power switch on and off at a 20 kHz rate. These high frequency pulses of current are filtered to provide a DC output to the arc lamp. Control of power output is done by the regulator board which senses output voltage and current, multiplies them and then compares the result to a reference voltage. Any deviation is an error and the control IC will adjust the PW to minimize the error of the output power. The result is a constant power output to the arc lamp.

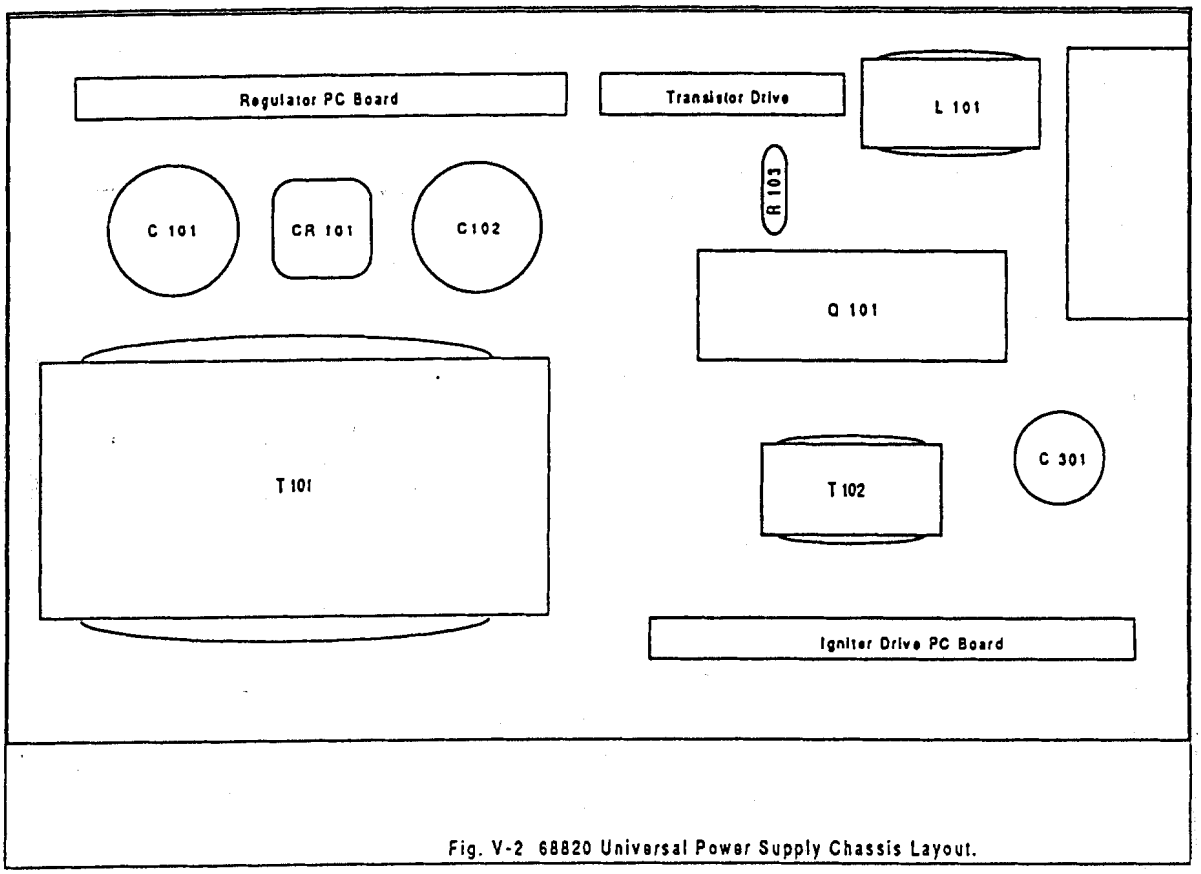


Fig. V-2 68820 Universal Power Supply Chassis Layout.

A detailed circuit description is given on the following pages. Please refer to schematic number 68820-4-1001 and Figure V.2 when reading this section.

MAINS AC-DC CONVERSION AND AUXILIARY POWER SUPPLY

The mains voltage is brought in via J304, at the rear panel, to the front panel power/CB switch, then to the main power transformer (T101) and to the auxiliary control panel transformer (T102). The cooling fan and connections (D) and (E) are always at 110 VAC operation.

T101 isolates and steps down the input mains so that at nominal line there will be 55 VAC on the secondary. This is rectified and filtered by CR101, C101 and C102 to provide an unregulated source of DC voltage for the main regulator circuit. At nominal line and no load, this is a 70 VDC. R101 and R102 will safely discharge C101 and C102 when the main power is off.

The secondaries of T102 each go to the three circuit boards to provide power for the regulator PCB, the switch drive PCB, the ignitor drive and the output monitor PCB.

CR6 and C5 provide the un-regulated DC voltage for the PWM IC switches. CR7, C3, U1 and CR4, C4, U2 provide the regulated ± 15 VDC for all the ICs on the regulator PCB. The last winding of T102 provides 24 AC power for the ignitor drive and output monitoring circuit only when there is an output voltage across the output connectors (J306 and J307).

SWITCHING TRANSISTOR AND RELATED DRIVE CIRCUIT

The constant frequency variable PW output of the regulator IC is transformer coupled to this PCB by T601 and T602. Since there are two output pulses per period, they are summed by Q603 and Q604 to provide a greater than 50% adjustment of duty cycle. This summed pulse controls Q602 which turns on only when both Q603 and Q604 are off. When Q602 turns on, base drive to Q601 is removed turning the Q601 off which in turn shuts the main switching transistor off. A -5V, 1 amp reverse current is also available to assist in the rapid turn off of Q601. When Q602 is off, Q601 turns on and biases Q101 into conduction.

The variable PW controls the on time of Q101 which applies more or less current to the filter circuit thereby changing the average value of the output. During the time that Q101 is off, L101 reverses polarity and CR102 maintains current flow around the filter loop.

< < < < < C A U T I O N > > > > >

The +18V, +9V and -5V supplies on this PCB are referenced to the emitter of Q101. Do not connect a grounded oscilloscope probe or a grounding wire to this emitter reference. Only a safely isolated scope or meter should be connected here in order to make measurements on this PCB.

HF FILTERING

The high current constant frequency and variable PW pulses are applied to the low pass LC filter combination of L101 and C301. These components average the current pulses to provide a filtered DC output to the load.

ERROR FEEDBACK AND PWM CONTROL

PWM is performed on the regulator card. The output voltage is sensed directly by divider R27 and R33 and the load current is sensed through the paralleled current sense resistors R103 and R103a which is amplified by U3. These scaled voltage and current outputs are applied to U5 for multiplication. The output is a representation of output power and is compared with a reference set by front panel pot R201 at U7. Any deviation from the reference is amplified within U7 and modulates the PW of the output transistors of U7. This modulated signal is transformer coupled to the transistor drive board.

The current sense signal is also amplified by U4 which then limits the maximum output current by controlling the maximum PW out of U7. As a secondary protection, the output of U4 also controls Q6 which will reduce output power by decreasing the reference level when Q6 is biased into conduction.

A tertiary over current protection shuts the regulator IC if a short circuit condition exists. Resistive divider R1 and R2 bias Q2 on when a voltage exists across the output of the power supply. At the same time a portion of the amplified output of the current sense amplifier (U3) exists at the ten volt zener (CR1). When a short circuit condition exists there will not be any voltage, therefore Q2 turns off. Also, the output of U3 will be at maximum (less than 14 volts) and the zener will break down and conduct current to the gate of the SCR (Q3). Once a gate signal is present, Q3 conducts and latches thereby removing bias from Q4 which turns off. With Q2 off, the shutdown control at pin 10 of U7 goes to a high level and shuts off the outputs of the regulator IC. The only way of re-starting the power supply is to shut the main power switch (CB201) off and then turn it on again.

The interlock circuitry performs the same way via CR13 and R13. If no interlock is present, pin 10 of U7 is at a high level. When the interlock is connected at J301, CR13 is reverse biased and pin 10 of U7 is at a low state which turns on the output of the regulator IC.

IC U6 buffers the internal reference so that it can be applied to the power meter for a pre-set adjustment or for use by an external accessory via J302.

IGNITOR DRIVE AND OUTPUT MONITOR CIRCUIT

The ignitor drive PCB contains circuitry to generate the 25kHz square wave required by the ignitor. It is a self oscillating invertor which starts when relay K401 energizes at an open circuit voltage of 40 volts or more. Relay contact K401-1 is closed and the start switch is pressed to apply 24 VAC to rectifier CR401. The filtered output is used by R401 to slightly bias Q401 into conduction.

Q401 goes into conduction more and more until T401 saturates. At saturation, Q401's collector current increases at the limit set by the beta of the transistor and input voltage. This limits collector current to one ampere. Since di/dt is removed from T401, Q401 shuts off due to lack of base drive. The flyback voltage is of the correct polarity to bias Q402 into conduction and the action repeats but of opposite polarity. The result will be a two to one unregulated step up on T401's secondary. This is nominally a 100V P-P square wave @ 30 kHz. This square wave is connected to the ignitor via J401 on the rear panel.

The SENSE CIRCUIT consisting of an op-amp (U401), divider resistors and Q403 monitor the output voltage for the low voltage condition which is normal operation during the starting cycle of the arc lamp. Before starting, the lamp is at open circuit voltage. Therefore, the comparator (U401) turns on Q403 with no load applied across the output. With Q403 on, relay K401 is energized and contacts K401-1 are closed to allow the AC voltage to be connected to the ignitor drive circuit. This is also connected to a capacitive multiplier to provide the boost voltage during the start phase of the lamp.

VI. CALIBRATION PROCEDURE

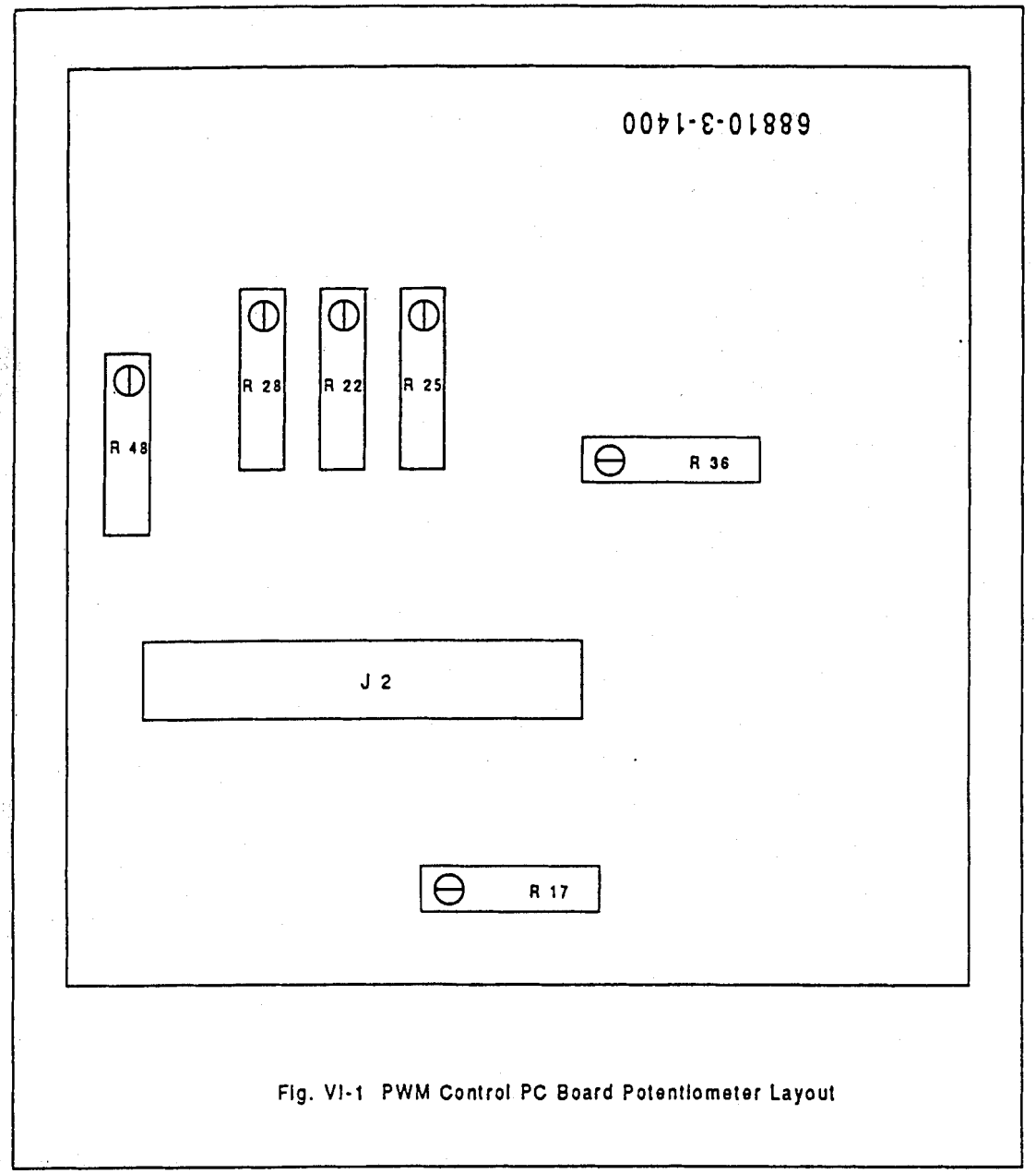


Fig. VI-1 PWM Control PC Board Potentiometer Layout

Calibration of the power supply should be performed by qualified personnel. It should be performed if the regulator PC board (68820-3-1400) is replaced. Please refer to Figure VI.1 for the adjustment potentiometer layout.

REQUIRED TEST EQUIPMENT

60 Ampere Ammeter

200 Volt Voltmeter

0.5 Ω, 1000 watt power resistor

0.3 Ω, 1000 watt power resistor

INITIAL CONDITIONS

Before applying an AC power to the power supply, set the controls listed below to the specified settings. Please refer to Figure VI.1 for the potentiometer layout.
NOTE: The PC card mounted potentiometers are 20 turns or more, end to end.

No.	Name	Location	Setting
R201	Output Adjust	Front Panel	Full CW
R17	E Meter Adjust	Regulator Card	Full CW
R22	I Limit Adjust	Regulator Card	Full CW
R25	I Meter Adjust	Regulator Card	Full CW
R28	I Gain Adjust	Regulator Card	Full CW
R36	Multiplier Offset	Regulator Card	Full CW
F48	P Meter Adjust	Regulator Card	Full CW

OPEN CIRCUIT TEST

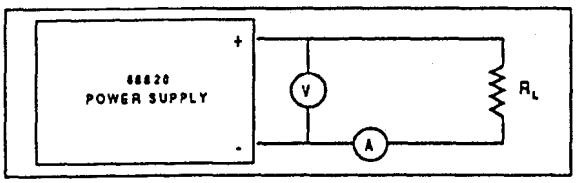
These test will insure that the proper voltages and preliminary setting will be correct.

1. Remove the interlock plug from J301 at the rear panel, plug the unit into the mains source and place the power switch on. The internal lamp in the power switch should turn on and the fan should be operating. There should not be any output voltage present.

2. Adjust R36 (Multiplier Offset) so that the power meter shows zero (0) power. Press and hold in the Output Pre-adjust switch and adjust R48 (P meter) for a full scale reading of 1200 watts. Adjust the Output Adjust (R201) potentiometer for a reading of 600 watts. Release the Output Pre-adjust switch.

3. Install the interlock plug into J301. There should be an output voltage of 70 volts DC or more. If necessary, trim R36 to display 0 output power. Shut the power supply off.

LOAD TEST AT 0.5Ω



1. Before beginning this test, connect the power supply, the meters and the load resistor as shown.

2. Turn on the power supply which should display 600 watts immediately after turn on.

3. Observe the external test meters and adjust R28 (I gain) for a true output of 600 watts.

4. Set the output to 1000 watts with the front panel Output Adjust control. Adjust R28 (I gain) for a true output of 1000 watts.

5. Set the output to 350 watts and trim R36 - MULTIPLIER ZERO - to output and display 350 watts. Continue to adjust the output, alternating between 350 and 1000 watts, trimming R36 for 350 watts and R28 for 1000 watts until the actual output is 2% of the displayed output.

6. Set the output voltage to 20 volts and adjust R17 (E meter) so that the front panel meter reads 20 volts when the volts-power-amps switch is in the volts position.

7. Set the output current to 40 amps and adjust R25 (I meter) so that the front panel meter reads 40 amps when the volts-power-amps switch is in the amps position.

8. Set the output power to maximum and adjust R22 (I limit) so that the output power is reduced by 1.0 watt.

9. Turn the power supply off and replace the 0.5Ω resistor with the 0.37Ω resistor. Turn the power back on and adjust R22 (I limit) for a maximum output current of 55 amperes. At loads of less than 0.37Ω impedance the short circuit protection circuit disables the output. If this occurs, turn the power supply off and then on again to reset the circuit.

VII. TROUBLESHOOTING

A careful reading of the circuit description should be done before attempting any repairs or adjustments. The information given in this section is based on prototype and reliability testing and is general in nature. Troubleshooting should be performed by qualified electronic service personnel. Careful use of test equipment or tools must be done especially when testing the high power section or the switching transistor drive PCB.

>>>>> WARNING <<<<<

Potentially lethal voltages exist In the power supply when power is applied and for a few minutes after power is removed. Extreme care should be taken when working within or near the power supply whenever the cover is removed.

If a problem exists with the power supply, a visual inspection of all components and wiring should be made. Inspect for obviously damaged or broken components before proceeding with power for testing of the power supply. Below are some items to check and their expected signals. For most of the troubleshooting, an oscilloscope is a necessary piece of test equipment. **PLEASE EXERCISE CAUTION WHEN TESTING THE TRANSISTOR DRIVE BOARD BECAUSE IT IS NOT REFERENCED TO GROUND. IT IS REFERENCED TO THE EMITTER OF Q101 AND IS THEREFORE FLOATING AT THE DC SUPPLY VOLTAGE.**

LOW VOLTAGE AUXILIARY SUPPLIES

Measurement Point (referenced to ground)	Expected Signal	Probable Cause
U7-15	+ 18VDC	CR6
U7-16	+ 5VDC	U7
U6-4	- 15VDC	U2
U6-7	+ 15VDC	U1

For the next three measurements, use an isolated oscilloscope if that is the instrument being used. Use J1-2 as reference.

R602-Positive side	+ 18V	R602,Q601,CR601 CR605,Q602
Q602-C	+ 9V	Q601,Q602,CR601 CR605
Q604-E	- 5V	Q602,CR605,CR602 Q604,Q603

If any of the above voltages are missing, check the auxiliary power supplies transformer for the proper AC voltages.

The following flow chart, Figure VII-1, will serve as a starting point for the repair of the power supply. Please observe all cautions previously mentioned. A qualified electronics technician should perform the troubleshooting and repair.

If the lamp does not start, the ignitor drive and the ignitor should be checked for proper operation. Please refer to the related documentation for the circuit diagrams and descriptions.

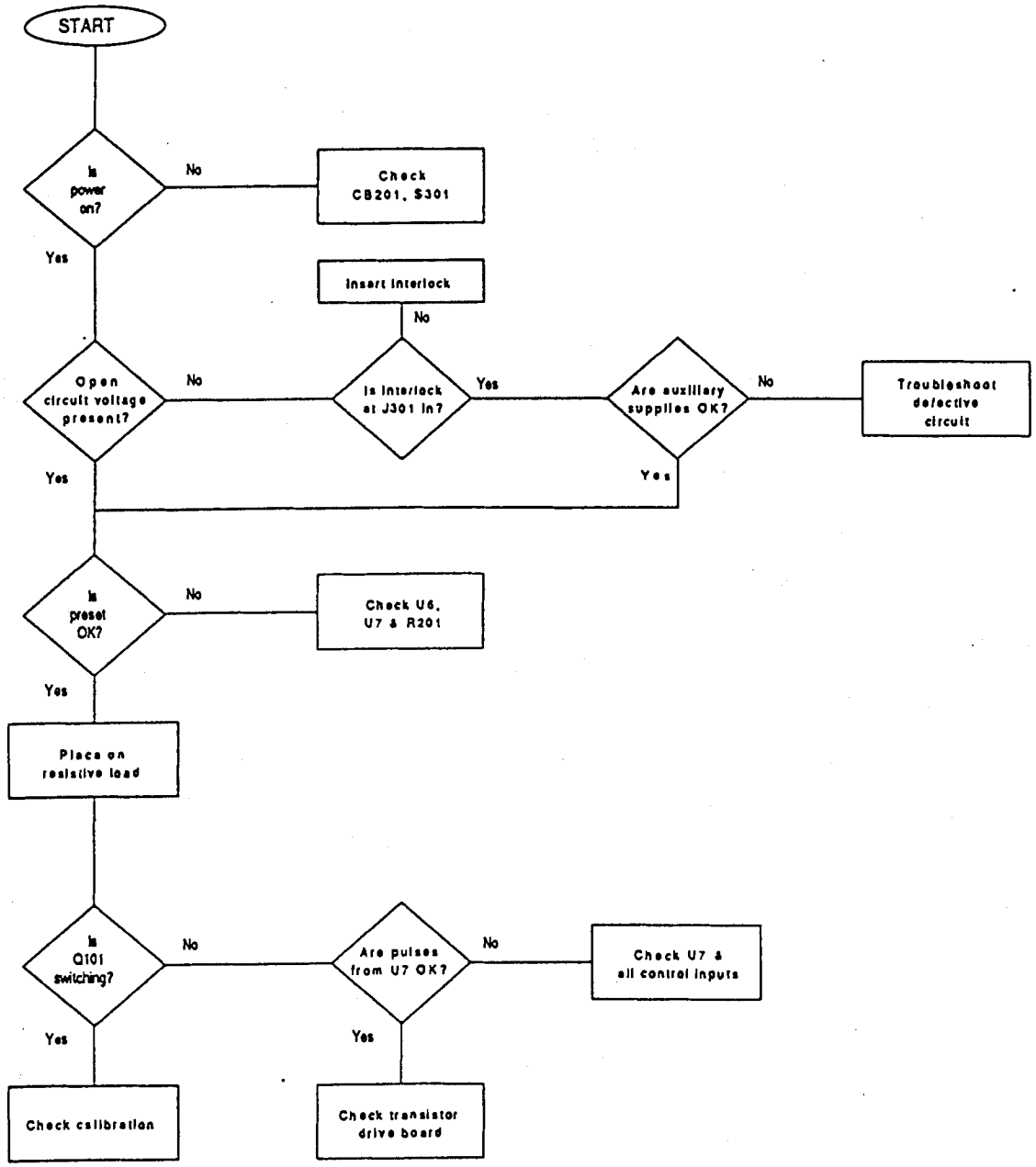


Fig. VII-1 Troubleshooting Flowchart

VIII. DRAWINGS

The following drawings are included with this manual:

Schematic

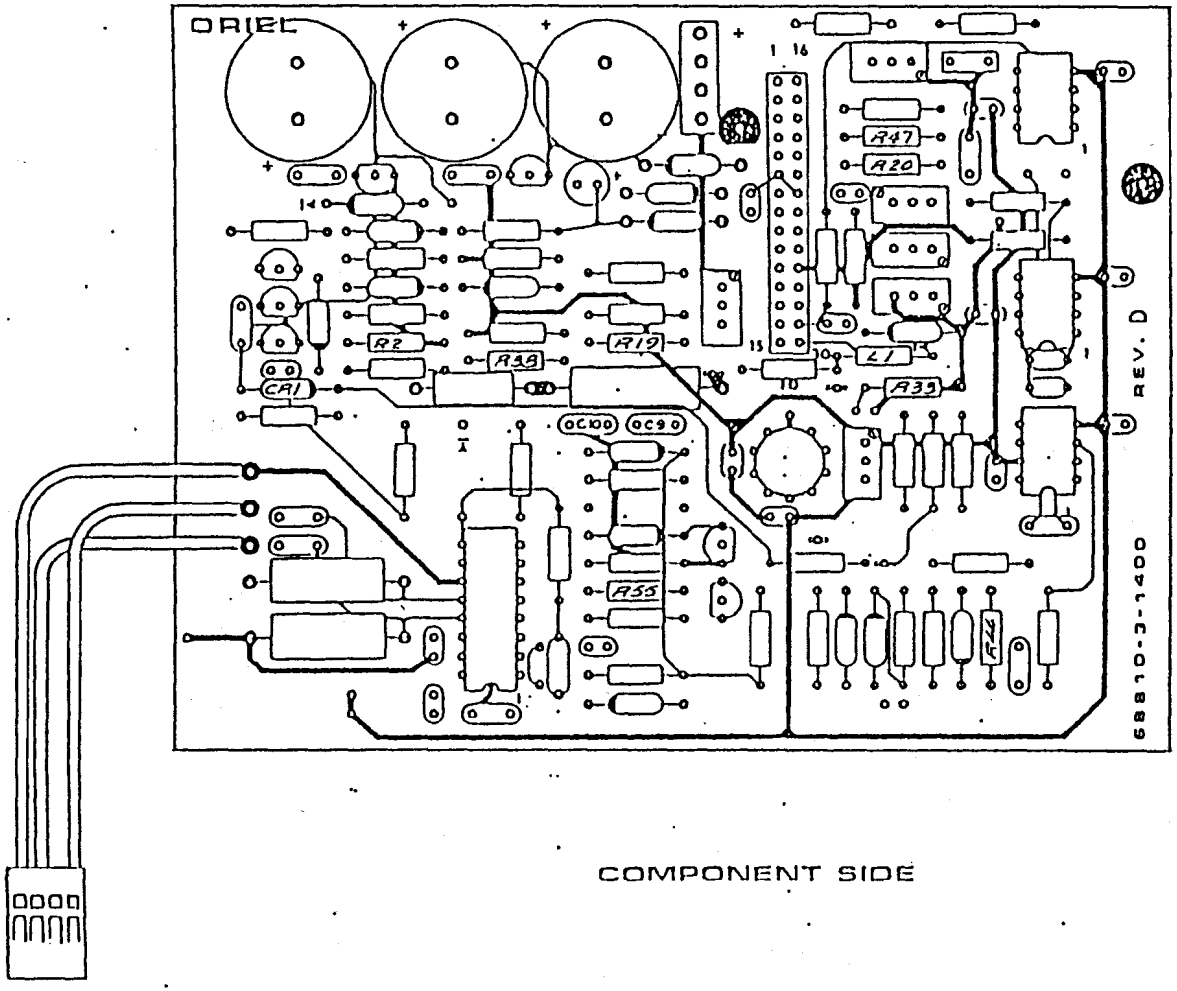
68820-4-1001	Power Supply

Drawings

68820-3-1400	Control Board
68810-3-1600	Ignitor Drive PC
68810-2-1500	Transistor Drive PC

Parts Lists: available upon request.

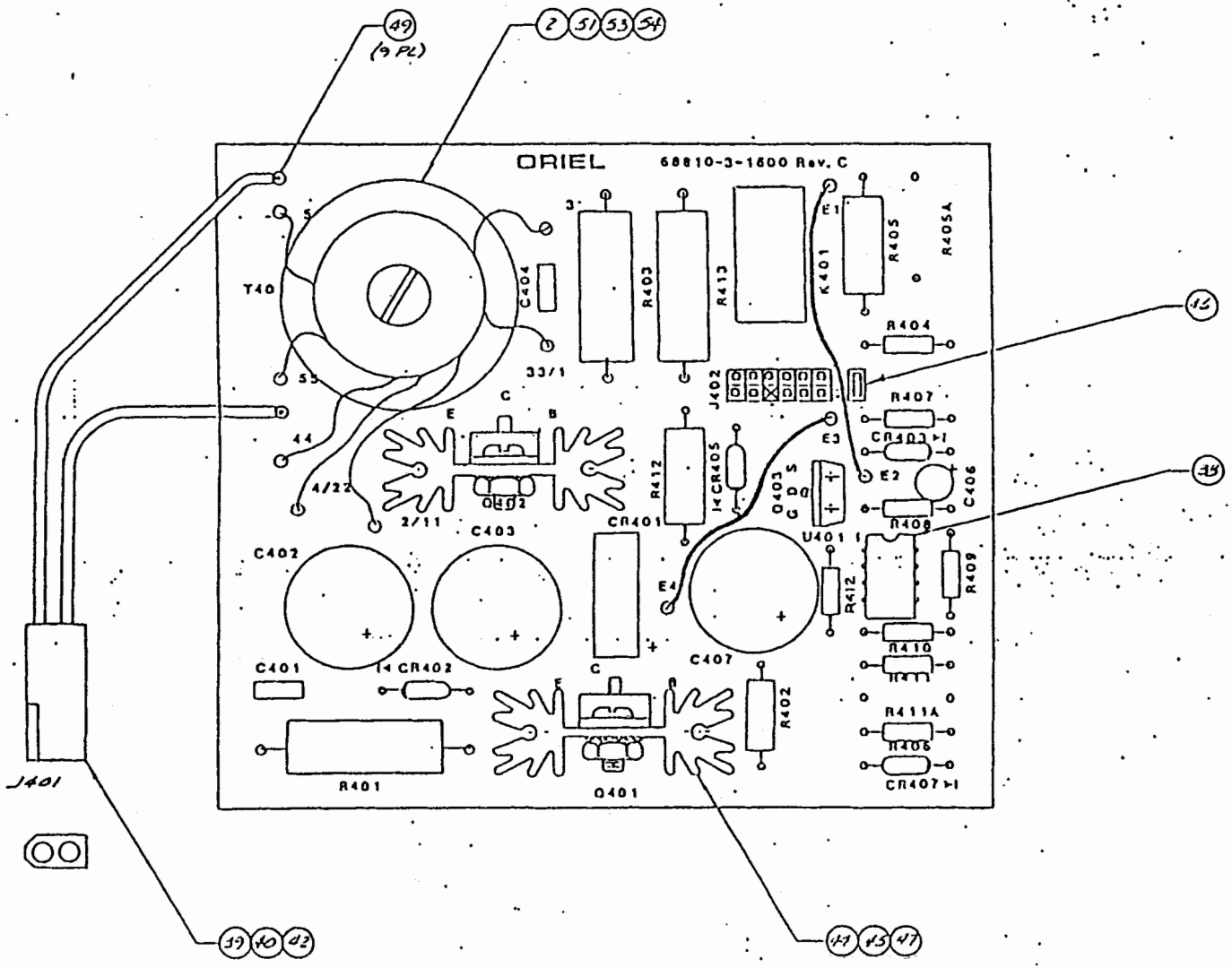
REV	DESCRIPTION	DATE	BY
C	REDESIGN / PILOT RELEASE	11-17-88	
D	ERN 1484 PRODUCTION REL.	3-8-89	



COMPONENT SIDE

	DATE DRAWN 3-8-89	ORIEL CORPORATION STRATFORD, CONNECTICUT
	DRAWN BY FLORRE	TITLE ASSEMBLY, FINAL, CONTROL BOARD 1KW POWER SUPPLY
DO NOT SCALE DRAWING	CHECKED	
		DRAWING NO 68820-3-1400
	SIZE	

R_	DE	PTIC		B.
A	ERR 10331	(REDESIGN-SAFETY)	6-29-87	JF
B	ERR 10380	(REVISED FOR LAUNCH)	9-8-87	JF
C	ERR 10382	(ATTACHMENT HOLES)	10-10-88	JF
D	ERN 174	PRODUCTION RE-RELEASE	12-19-88	LW

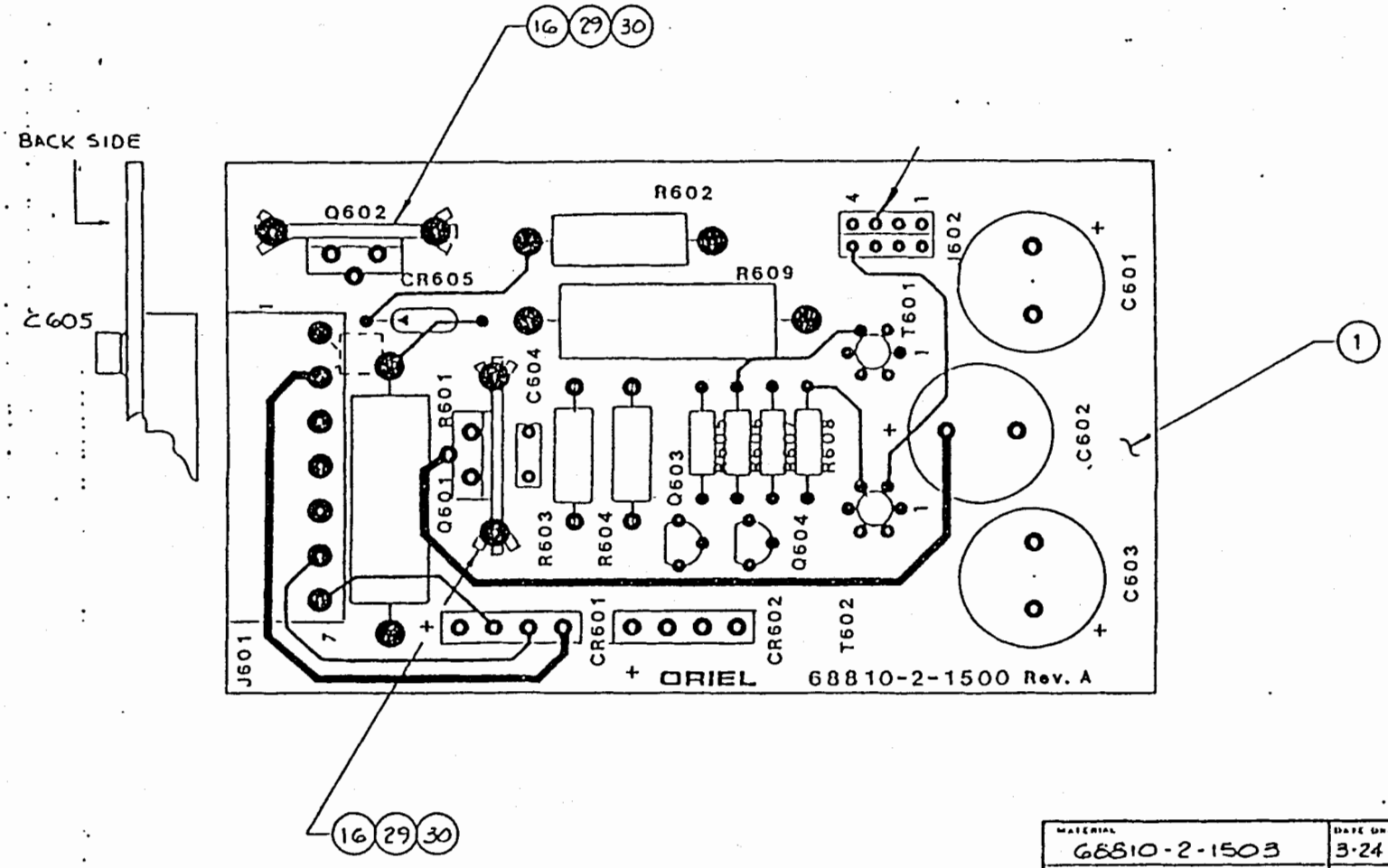


WIRE RUN LIST					
WIRE	COLOR	AWG	LENGTH	FROM	TO
1	BROWN	22	4.0	E1	E2
2	RED	22	3.5	E3	E4

NOTE:

CUT PIN 8, ON J402, OFF FLUSH WITH PLASTIC BASE (MARKED X).

68810-3-1600	10-7-88	ORIEL CORPORATION STRATFORD, CONNECTICUT
	FLORES	ASSEMBLY IGNITOR DRIVE (UNIVERSAL CONFIGURATION)
		68810-3-1600



MATERIAL 68810-2-1503	DATE DRAWN 3-24-87	ORIEL CORPORATION STRATFORD, CONNECTICUT	
FINISH	DRAWN BY FLORRE		
DO NOT SCALE DRAWING	CHECKED	TITLE ASSEMBLY DRIVE P.C.B.	
SURFACES TO BE ____ √ RMS UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES FRACTIONS 2 PLACE 3 PLACE ANGLES			
SHARP CORNERS TO BE .005 MAX RADIUS CHAMFERS NOT DIMENSIONED TO BE .03X45° ANY Ø DIA CONCENTRIC WITHIN .005 TIR	SCALE	DRAWING NO 68810-2-1500	

UNLESS OTHERWISE SPECIFIED THIS PART MUST BE FREE OF HEAVY MACHINING AND EXTRUSION BURRS, GOUGES, NICKS AND DENTS BREAK ALL SHARP CORNERS AND REMOVE ALL BURRS PARTS MUST BE CLEANED, FREE OF CHIPS, GRIT, GREASE, OIL, ETC

XI. REPLACEMENT ITEMS

DESCRIPTION	MODEL NUMBER
1000 Watt Xenon Arc Lamp Ozone Free	62710
1000 Watt Xenon Arc Lamp UV Enhanced	62690
UVB/UVA Dichroic Mirror (280-400nm) (Included with all 1000 Watt Solar UV Simulators)	81035
Full Reflecting Mirror (250-2500nm) (Included with all 1000 Watt Solar Simulators)	6735-2-1005
Ellipsoidal Reflector Assembly	8071-400
Threaded Lamp Adapter	8071-2-1005
Lamp Heat Sink	8071-510
Shutter Assembly	8071-210

AIR MASS FILTERS

Air Mass 0 (outer space)	81011
Air Mass 1 Direct	81011 & 81074
Air Mass 1.5 Direct	81011 & 81075
Air Mass 2 Direct	81011 & 81076
Air Mass 1.5 Global	81011 & 81074

UV FILTERS

UVC Blocking Filter	81051
UVC/UVB Blocking Filter	81050
Atmospheric Attenuation Filter	81017

OPTIONAL COMPONENTS

High Flux Beam Concentrator (useable with Models 81290 & 81191 only)	81030
Digital Timer	84350
Light Intensity Controller	68851
Power Meter	70160
Broadband Probe	70161

XII. ACCESSORIES

LIGHT INTENSITY CONTROLLER

- Reduces long term variations in solar simulator output.
- Digital readout allows you to monitor and set intensity level.

Oriel's 68851 Light Intensity Controller interfaces with several Oriel power supplies to maintain a constant light level regardless of lamp aging or changes in ambient temperature. The 68851 includes a temperature stabilized light sensing head, a controller unit with readout, a filter holder, and necessary mounting hardware. A light intensity filter is required to attenuate the radiation hitting the sensing head. The following page lists the appropriate filters.

THE NEED

Our Solar Simulators have highly regulated power supplies to operate the lamp at constant power, even if the line voltage changes over a wide range. But even if the lamp current is constant, the light output of many xenon lamps varies with electrode erosion, gas absorption or desorption, and aging. The UV output of the lamp falls more rapidly than the total output. Our reliable Light Intensity Controller is designed to maintain a constant level of radiation to ensure more accurate exposures. The principal benefit is the long term stability.

HOW IT WORKS

The 68851 has a highly stable light sensing head that monitors part of the lamp output. The controller constantly compares the recorded signal to the set level, and changes the power supply setting to keep the measured signal at the set level.

THE LIGHT SENSING HEAD

The light sensing head houses a UV enhanced silicon photodiode. the photo diode is temperature stabilized to maintain complete independence from temperature variations; this means you don't have to worry about variations in the ambient temperature affecting the reading. the choice of photodiode and temperature control provide a highly reliable long term reference to ensure the light level you have next month is the same as the one you have today.

THE STAND ALONE CONTROLLER

The separate controller housed the two regulator circuits and readout. As the lamps ages, the controller signals the arc lamp power supply to keep the light output constant. You can switch the readout to display light level or sensor temperature. An LED, located below the display, is green when the light signal matches the selected setpoint. When the LED is red, the 68851 is not controlling the lamp.

THE IDLE CONTROL

The Light Intensity Idle Control is designed to work specifically with Oriel Solar Simulators where there is a light shutter between the detector head and the arc lamp. When the shutter closes, the idle system drops the power to the lamp to ~85% of rated power. When the shutter opens, the power is quickly restored to the exact preset value. Advantages include longer lamp life, lower power consumption, and less heat generation during idle periods.

THE LIGHT INTENSITY FILTER

The 68851 requires a Light Intensity Filter which fits into the holder that comes with the 68851. The filter attenuates the light from the arc lamp to prevent saturation of the light sensing head. It also serves as a thermal barrier, protecting the detector head from high levels of heat. Select the appropriate filter for your solar simulator from the list on the next page. The Filter Holder mounts to the sensor head via a 1.5 inch series flange.

MOUNTING

The Light Sensing Head of the 68851 is mounted directly to the Solar Simulator housing, via a mounting block. 5ft. (1.5 m) long cables connect the head to the controller.

Light Intensity Controller Includes light sensing head, controller, filter holder, and necessary mounting hardware.	68851

LIGHT INTENSITY FILTERS

Filter for 300 W Solar Simulator Model 81160	68892
Filter for 300 W Solar UV Simulator Model 81260	68893
Filter for 1000 W Solar Simulator 2" x 2" beam size Model 81191	68894
Filter for 1000 W Solar Simulator 4" x 4" beam size Model 81192	68892
Filter for 1000 W Solar Simulator 6" x 6" beam size Model 81193	68895
Filter for 1000 W Solar Simulator 8" x 8" beam size Model 81194	68896
Filter for 1000 W Solar UV Simulator 2" x 2" beam size Model 81290	68897
Filter for 1000 W Solar UV Simulator 4" x 4" beam size Model 81291	68893
Filter for 1000 W Solar UV Simulator 6" x 6" beam size Model 81292	68898
Filter for 1000 W Solar UV Simulator 8" x 8" beam size Model 81293	68899

BROADBAND RADIANT POWER METER

- Measures radiant power and energy
- No more fudge factors! flat response independent of wavelength for the UV to the IR
- 4 digit autoranging readout from 1 μW to 2 W
- Intuitive operation through simple on-screen menu selections
- Selectable 190 nm - 2.8 μm range to exclude background thermal radiation
- Rechargeable battery pack for cord/cordless operation

The 70160 Radiant Power Meter, combined with the 70161 Probe, measures the power level of any monochromatic or broadband source. the proprietary sensor element of the probe has uniform response over its 8 mm diameter area, and is wavelength independent. This allows you to measure the total broadband or filtered output from our Solar Simulators with out the need for individual wavelength fudge factors!

A four digit backlit autoranging display gives a maximum resolution of 0.01% of full scale, with a minimum readability of 1 μW.

REAL TIME METER

In addition to the numeric readout, the 70160 has a simulated analog meter which displays the signal reading. This meter is a convenient tool for visually adjusting your Solar Simulator to obtain maximum power. (Use a combination of power supply and optical system adjustments to maximize Solar Simulator power.)

CALIBRATED WITH NIST TRACEABLE STANDARDS

We calibrate this instrument using standard lamps and blackbodies. We cross check our calibration and instrument linearity with other detectors to ensure accuracy. Unlike most detector companies we have, and use, our in-house capability for checking responsivity throughout the spectrum.

A special 190 nm - 2.8 μm filter allows fully calibrated measurements to be made without interference from background thermal radiation. (The filter comes with the 70161 Probe.)

DESIGNED FOR POWER AND ENERGY MEASUREMENTS

You can switch the display to read power or energy units. In Power Display you may switch between average power level (W) and power density (W/cm^2).

If you want Energy Display, the 70160 measures integrated received energy in joules (1 J = Ws) or energy density (J/cm^2).

Measurements of incident radiation energy can be made in three modes:

- Continuous with elapsed time indication
- Timed over selectable periods
- Single pulsed (auto triggered)

A stop watch feature allows you to temporarily stop energy measurements and hold the reading, and then resume operation without resetting to zero.

WHAT THE INSTRUMENT CANNOT DO

Oriel wants you to have the light measuring instrument you need. This instrument is the best available for continuous, or repetitive pulse, power and dose measurements. It will not measure the peak power or duration of very short pulses. As a thermal instrument, it cannot follow rapid changes in power, and of course, the sensitivity and thermally inducted drifts make it most suitable for input powers of more than a few tens of μW. Ask our AEG Sales Department about our photodiode based instruments for measurement of lower fluxes in the UV and visible, and our calibrated Merlin™ system for precise, low level radiation measurements throughout the spectrum.

SPECIFICATIONS

Spectral range:		190nm to 20μm
Maximum power and energy:		2 W, 2 J
Probe aperture:		8 mm diameter
Response uniformity:	± 2%	
Response time:		<0.5 s
Display:		128 x 64 pixel LCD
Numeric readout:		4 digit

ORDERING INFORMATION

Radiant Power Meter	70160
Broadband Probe	70161

DIGITAL TIMER

- Lets you preset exposure dose in 0.1 second increments from 0 to 999.9 seconds
- Ensures accurate and consistent timed exposures
- Convenient; eliminates the need for "stopwatch" monitoring

For accurate and consistent timed exposures, use the 84350 Digital Timer. This reliable electronic timer controls the opening of the splitblade light shutter on all Oriel Solar Simulators. No longer do you have to stand around and manually time the shutter!

You can preset the exposure duration from 0 to 999.9 seconds in 0.1 second increments. When the preset time has elapsed, the shutter closes. The timer resets itself and is ready for the next exposure.

Operate the 84350 from it's front panel, or remotely via contact closure or computer (10 mA current sink required). For more information on computer control, contact Oriel's AEG Department.

ORDERING INFORMATION

Digital Timer	84350

Includes 8 ft. (2.4 m) connector cable.

HIGH FLUX BEAM CONCENTRATOR

- Saves time; increases energy density by 7X for accelerated testing.
- Usable with Oriel 1000 Watt Solar Simulator with a 2 x 2 inch output beam.

The 81030 High Flux Beam Concentrator focuses the 2 x 2 inch (51 x 51 mm) output beam from our 1000 W Solar Simulator down to a 0.6 inch (15 mm) diameter spot, increasing the energy density by 7X with a ±5% intensity uniformity. The Beam Concentrator consists of a multi-element fused silica lens mounted in a tube that attaches to the output assembly of the simulator, as shown in Fig. 2.

The output of the 81030 is equivalent to the intensity of 30-50 "suns". It is very useful for high flux applications such as accelerated photodegradation studies and materials testing. All air mass filters except AM 1.5 global are usable with the Beam Concentrator.

When you use this device with our broadband simulators, you will produce a spot with intense UV, visible, and infrared radiation. In addition to the UV hazards, you should be conscious of possible combustion hazards should you use flammable absorbing targets.

When coupled with a Solar UV Simulator, the 81030 produces extremely high UV irradiance with greatly reduced VIS and IR content. (Note: the 81030 causes severe burns even with extremely short exposures. Protective eyewear and clothing **must** be worn when working with high intensity ultraviolet radiation.

The Beam Concentrator extends 1 inch (25.4 mm) below the base of the Solar Simulator. The 81030 comes with a stand which elevates the Solar Simulator. The 81030 comes with a stand which elevates the Solar Simulator 9 inches (229 mm). This allows 8 inches (203 mm) below the end of the Beam Concentrator for fixturing and sample orientation.

CAUTION: This device increases the irradiance level, increases potential UV hazards, and can cause flammable materials to ignite.

ORDERING INFORMATION

High Flux Beam Concentrator Includes stand.	81030

ULTRAVIOLET SAFETY EQUIPMENT

Exposure to intense ultraviolet radiation for a prolonged period of time can be very dangerous, especially to the eyes. Even after a short time, UV radiation will cause reddening and burning of the skin and eyes. Our Solar Simulators, particularly the UV versions, produce high intensity, harmful ultraviolet radiation. Protective eyewear and clothing should be worn by all personnel operating these sources.

- Excellent visible transmittance.
- Comfortable and lightweight.
- High-impact Polycarbonate lenses.
- Comply with ANSI Z87.1 standards.

Our eyewear protects you from the intense UV output of the Solar Simulators without significantly reducing your visibility. (See Fig. 1 for a typical transmittance curve.)

We offer two types: spectacles and goggles. The spectacle style frame affords greater comfort. It is made from hard durable plastic, with close fitting side shields to prevent UV radiation from reaching the eyes. The recessed lenses are protected from scratches.

The goggles have a soft, flexible frame with adjusting head band. Screened ventilation parts minimize moisture build-up. These goggles may be worn over prescription glasses with 50 mm lenses.

PROTECTIVE GLOVES

Hands working with fixtures in the beam are particularly prone to UV exposure. Even minimal exposure may cause burning of the skin. Our black neoprene gloves protect the hands, yet maintain the flexibility necessary for manipulation of small components.

The gloves are made from neoprene with a soft, cotton flock lining which absorbs perspiration of easy on and off. Two sizes are available 8 and 10.

LIGHTED SIGNS

Our Lights Warning Signs are primarily used for areas of intense UV exposure. They are large, highly visible signs which accommodate a wide range of mounting configurations. We recommend permanent installation with the sign hard wired to the wall or access door to the UV area. A 25 ft. (7.6 m) cable is supplied to connect the sign to your solar simulator. The sign will operate when the simulator is on and the shutter is open.

The 79004 and 79005 Sets consist of an injection-molded thermoplastic white frame and a steel face which holds a fiberglass panel. The legend is placed in front of this panel. Each Set includes six legends. Simply install the legend you need and store or discard the rest.

Two extended life 12 watt lamps, a 6 ft. (1.8 m) power cord, and a 25 ft. (7.6 m) interlock cable are also supplied.

These signs may be operated in three modes. An internal selector switch allows you to choose between continuous light, flashing light, and flashing light with an audible beep. The "beep" volume is regulated by an internal potentiometer control. All three modes are switched by the interlock contact closure. The flashing light and beep draw attention to the sign and are most effective if used only when the hazardous light source is operating.

ADHESIVE BACKED SIGNS

These signs are the legends from the illuminated sign with an adhesive backing. They are made of flexible mylar with a peel-off adhesive back.

ORDERING INFORMATION

UV Safety Spectacles	49125
UV Safety Goggles	49126
Protective Gloves Size 10 (Package of 3 pairs)	49121
Protective Gloves Size 8 (Package of 3 pairs)	49123
Lighted Warning Signs 115 VAC, 250 mA, 50/60 Hz; Set of six legends	79004
Lighted Warning Signs 230 VAC, 125 mA, 50/60 Hz; Set of six legends	79005
Adhesive Backed Warning Signs Set of six legends	79006
Set of Two Spare Lamps (For 79004 & 79005 Lighted Signs)	79009

PROCLEAN

- Cleans solar simulator optics to ensure best possible performance.
- Simple and ready to use; no mixing or preparation required.

The lamp housings of the Oriel 300 and 1000 Watt Solar Simulators are cooled by high velocity fans. An air cooled system means that dirt, grease, and other airborne contaminants are drawn into the illuminator housing and adhere to the optical surfaces within. (Note: Dirt and invisible films quickly degrade UV performance.) Depending on the cleanliness of your operating environment, we recommend you clean all optical components regularly to ensure maximum performance.

The 49160 ProClean Coating cleans uncoated and nonmetallic coated optics. Use it to clean air mass filters, light intensity controller filters, collimating lenses, or any other hard coated optic. (Use the Metallic Reflector Cleaning Fluid described on the right for metallic coated optics.)

Proclean comes ready-to-use. No preparation or special tools are required - just a soft bristle brush, common adhesive back labels, and a dirty optic!

APPLICATION

1. Brush On - Pour ProClean in the center of the optic and use a soft bristle brush to evenly coat the surface. We recommend sable brushes.

2. Let Cure - Wait for the polymer to cure, about 15 minutes for small optics, or until the entire surface looks milky. Do not attempt to peel off proclean until it is completely dry.

3. Peel Off - With an adhesive back label, peel off the coating. It peels away in one piece. (Note: to ensure maximum result and prevent breakage, use extreme care when peeling off the ProClean coating from the surface of an optic.)

The metallic ellipsoidal reflectors and large turning mirrors in our Solar Simulators are overcoated with Si02 for protection; however, special care is necessary during cleaning.

Our 49122 Metallic Reflector Cleaning Fluid safely and effectively removes dust, dirt, and other surface particulates from these reflectors. You can also use this solution to clean the dichroic mirror in our Solar UV Simulators.

For safe, routine cleaning of the simulator overcoated metallic reflectors we recommend the Drag Wipe Method.

1. Remove large particles using an optical brush, dust bulb, or source of compressed air. Inspect to ensure complete removal of loose particals.

2. Drop one or two drops of our 49122 Cleaning Fluid directly on the reflector. Drape a clean piece of lens tissue on the wetted surface, and gently drag the tissue across the surface, pulling the wet-dry interface as you go. Repeat this step using a clean sheet of tissue each time, until the surface is clean.

A FEW NOTES. . .

- Do not use the Drag Wipe method to remove large particulates. You will scratch the reflector as you drag the particulates across the surface.

- Do not drag wipe your reflector without wearing gloves or finger cots. Finger oils can transfer to the wet tissue and spread, contaminating the reflector.

- Do not reuse lens tissue.

- Do not set the reflector down on a dirty surface when you are finished.

ProClean Coating 49160
1 pint bottle

Metallic Reflector Cleaning Fluid 49805
1.75 oz. container

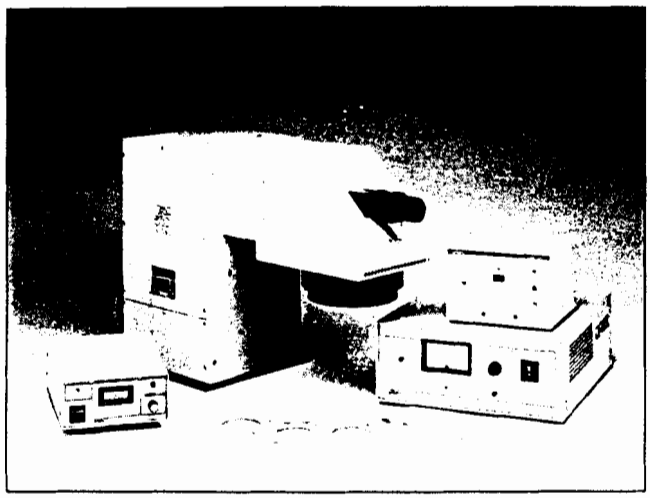
Optical Cleaning Tissue 49805
12 books of fifty, 4 x 6 inch tissues

Latex Gloves, small/medium 49171
Package of 12 pairs

Latex Gloves, medium/large 49175
Package of 12 pairs

Finger Cots package of 30 49070

Guide to Cleaning Research 49000
Optics Booklet



81192 Solar Simulator with Power Supply, 84350 Digital Timer, 68851 Light Intensity Controller, and 81014 Direct Air Mass Filter Set.

- **Run tests when you want to. Weather conditions and time of day are no longer barriers to your research.**
- **Simulate a wide variety of solar spectra with easily interchangeable "air mass" filters.**
- **Irradiate samples up to 8 x 8 inches (203 x 203 mm), or many smaller samples simultaneously.**
- **Save time. Simulate hours of solar radiation in minutes.**
- **Easy to operate.**

Applications

- **Environmental studies - effects of the disappearing ozone layer**
- **Accelerated photodegradation studies**
- **Cosmetics/dermatology testing**
- **Development of solar energy converters, including photovoltaics.**
- **Heads up display evaluation.**

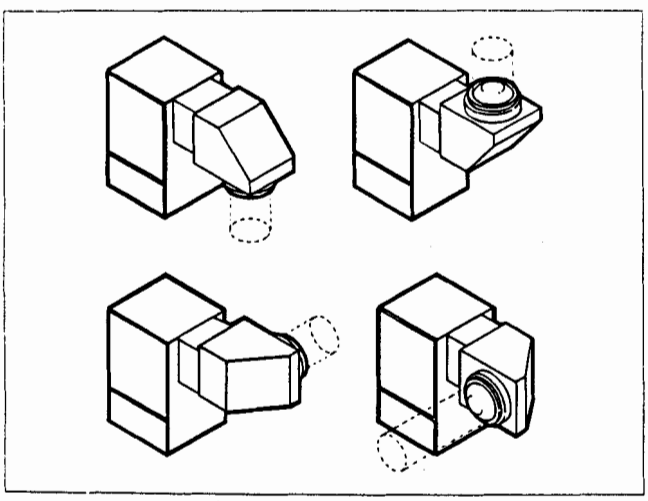


Fig. 1 81192 output beam assembly configurations.

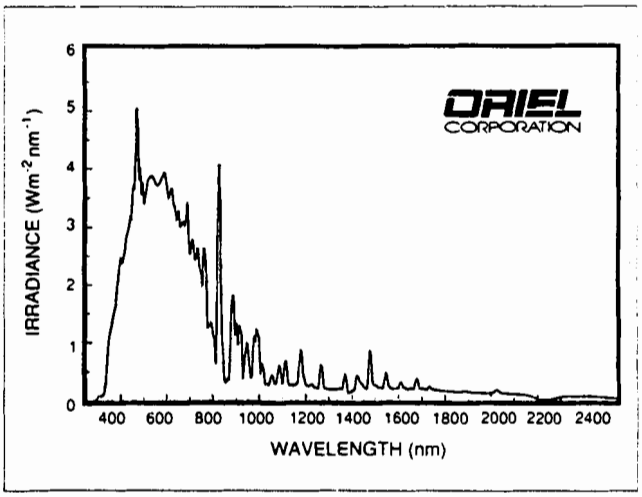


Fig. 2 Irradiance of 1000 W Solar Simulator, 4 x 4 inch beam size, with AM 1.5 Global Filter. Other spectra are on pages 26 to 28.

The Oriel 1000 Watt Solar Simulators produce uniform, collimated output beams with a close spectral match to sunlight. Four different output assemblies are available to produce a 2 x 2 inch (51 x 51 mm), 4 x 4 inch (102 x 102 mm), 6 x 6 inch (152 x 152 mm), or an 8 x 8 inch (203 x 203 mm) beam. For large area applications that do not require collimation, we offer the 81190 Diverging Beam Solar Simulator which produces a diverging output beam up to 12 x 12 inches (305 x 305 mm).

The output beam assembly can be rotated 90° to produce a horizontal or vertical beam. (Note: Due to the weight of the lens, the output assembly on the 8 x 8 inch (203 x 203 mm) model can only be positioned to produce a vertical beam, unless additional structural support is provided.)

When used with our easily interchangeable "air mass" filters, these sources simulate a variety of solar spectra. An ozone free xenon arc lamp is supplied with each of these Simulators. It is recommended for Air Mass 1, 1.5, and 2 spectra or where deep UV (below 260 nm) is not required. A UV enhanced xenon arc lamp is also available. This lamp, which can be easily interchanged with the ozone free model, produces output below 260 nm for deep UV (AM 0) studies.

For high flux applications, such as accelerated photodegradation studies and materials testing, we offer the 81030 High Flux Beam Concentrator. The 81030 focuses the 2 x 2 inch (51 x 51 mm) output beam down to a 0.6 inch (15 mm) diameter spot, increasing the energy density by 7 times. (Note: You cannot use it with larger area illuminators.) For more information on Model 81030 and other accessories see pages 59 to 65.

For applications requiring short wave ultraviolet see page 46 for a 1000 watt unit that produces UV with greatly reduced VIS and IR output.

WHAT MAKES UP A SOLAR SIMULATOR?

The Illuminator Housing

The housing contains the arc lamp, arc lamp ignitor, optical integrator, collimating optics, light shutter, and light shutter power supply. It is equipped with a safety interlock and a thermal interlock system to ensure operator and system safety. Integral fans and filter blower provide forced air cooling to ensure optimal lamp, optics, and housing temperatures.

1000 Watt Xenon Arc Lamp

This high pressure short arc lamp is available in ozone free and UV enhanced models. The 1000 Watt Solar Simulators come standard with an ozone free lamp which has negligible output below 260 nm. If you need the deep UV wavelengths, choose the 62690, UV enhanced lamp. (Note, read the safety section on page 58 before operation.)

The High Voltage Ignitor

To improve lamp start reliability and reduce E.M.I., we built the high voltage ignitor into the lamp housing. This reliable ignitor generates high voltage pulses to start the lamp.

The Power Supply

The highly regulated Power Supply provides constant electrical power to the xenon arc lamp. A convenient preview feature enables you to set the power of the lamp prior to ignition. This reduces set up time, since there is no need to wait through the lamp's warm up period to establish the operating power.

The output of a lamp can vary even when the input current is held very constant. Changes in lamp output are usually the result of factors such as lamp aging, line voltage variations, or changes in ambient temperature

Our optional 68851 Light Intensity Controller interfaces directly with the power supply to ensure the stability of the entire lamp output or that of a selected spectral region. See page 60 for more details on our Light Intensity System.

DIGITAL CONTROL PANEL

The digital control panel is visibly located on the side of the lamp housing. A variety of features lets you conveniently monitor and control the operation of the 1000 Watt Solar Simulator.

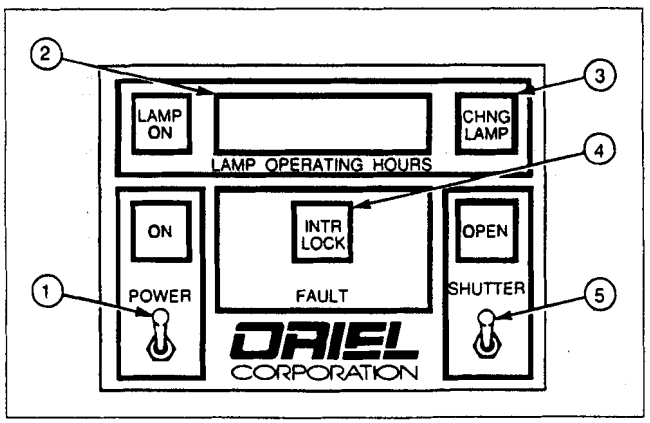


Fig. 3 Digital Control Panel.

1. **Power On/Off Switch**
   This toggle switch shuts down the housing operation and the digital display panel.
2. **Digital Elapsed Time Indicator**
   A digital display indicator provides a convenient way to monitor lamp aging. Elapsed time is recorded in 0.1 hour increments up to 10,000 hours. This indicator can be reset when the lamp is replaced. (Note: Xenon arc lamps should be replaced every 900 hours to ensure optimum performance and to avoid catastrophic lamp failure.)
3. **"Change Lamp" Indicator**
   This indicator can be preset to match the recommended lamp life of the arc lamp. After the designated time has elapsed, a red light labeled "change lamp" reminds you to replace the lamp.
4. **Fault Indicator**
   A red light labeled "interlock" provides a visual warning that a housing interlock system is "open". The entire system will automatically shut down when this occurs.
5. **Light Shutter Switch**
   This electronic shutter switch opens and closes the splitblade light shutter, as needed.

OPTICAL SYSTEM

An ellipsoidal reflector surrounds the lamp and collects over 70% of the lamp output. The radiation is focused onto an optical integrator which produces a uniform diverging beam. This beam is deflected 90° by a mirror to a final collimating lens. The output is a uniform collimated beam.

We offer 4 different collimated output beam assemblies. These produce a 2 x 2 inch (51 x 51 mm), 4 x 4 inch (102 x 102 mm), 6 x 6 inch (152 x 152 mm), or 8 x 8 inch (203 x 203 mm) collimated beam. Each unit is laser aligned to ensure optimal beam uniformity, collimation, and intensity. In addition, we offer the 1000 Watt Diverging Beam Solar Simulator which produces a diverging output beam up to 12 x 12 inches (305 x 305 mm). See page 11 for a detailed diagram of the optical system.

MANUAL OR AUTOMATED EXPOSURE CONTROL

An electronic splitblade shutter comes with each Oriel Solar Simulator. In addition to the switch on the Digital Front Panel, you can control the shutter from a hand held switch, or via a contact closure. For computer control, logic level input is required.

For automated exposure control, our 84350 Digital Timer and our 68851 Light Intensity Controller are available. The Digital Timer lets you preset the exposure dosage needed to meet your requirements. For long term exposures, we recommend the Light Intensity Controller. This intensity control system maintains a constant level of light regardless of lamp aging or changes in ambient temperature. See pages 60 to 62 for more details on our Digital Timer and Light Intensity Controller.

SAFETY INTERLOCK SYSTEM

The illuminator housing includes three safety interlock systems. Opening the housing door triggers an electrical interlock to automatically shut down the system. This prevents inadvertent operator exposure to the lamp. A thermal interlock shuts down the system if the temperature within the housing exceeds the level required for safe operation. A third interlock shuts off the lamp if the fan or blower fail.

ADJUSTMENTS IN BEAM POWER

The beam power is adjustable down to 25% of full power through a combination of power supply and optical system adjustments. For applications requiring a specific output intensity, a calibrated radiometric system is suggested to assure precise attenuation of the beam. See page 56 for information on suitable radiometric systems.

OPTIONAL AIR MASS FILTERS

Air mass filters, when used with these sources, simulate a wide variety of solar spectra. These filters are described in detail on page 41 and listed on the ordering information page. For information on our complete line of UV blocking filters, contact Oriel's AEG Department. (Note: You cannot use many bandpass filters at the output of this solar simulator. The filters may break.) See page 46 for a system with a dichroic heat removing mirror that allows you to use some filters.

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TYPICAL BEAM POWER AT FULL OUTPUT

Collimated Beam Solar Simulators

The table below shows the typical output of these simulators in W/m^2 in the design irradiated plane.

With Air Mass Filter	Typical Output (W/m^2)							
	2 x 2 Inch		4 x 4 Inch		6 x 6 Inch		8 x 8 Inch	
	250-2500 nm	250-1100 nm	250-2500 nm	250-1100 nm	250-2500 nm	250-1100 nm	250-2500 nm	250-1100 nm
AM 1 Direct	11475	8160	3060	2175	1400	1000	850	600
AM 1.5 Direct	10360	7350	2765	1960	1270	900	760	540
AM 2 Direct	9750	6800	2600	1820	1200	840	720	500
AM 1.5 Global	7150	6110	1910	1630	875	750	525	450
AM 0	13406	9800	3575	2640	1640	1200	980	715
Unfiltered Irradiance	17120	13700	4565	3650	2100	1680	1250	1000
Solar UV Simulator (see page 46)	3400	3050	915	820	490	440	290	260

Diverging Beam Solar Simulator

The table below shows the size of the output beam of our 81190 Diverging Solar Simulator, at specific work plane distances. In place of the collimating lens, the 81190 has a window.

For This Beam Size Inch (mm)	This Work Plane Distance is Required* Inch (mm)
4 x 4 (102 x 102)	3 (76)
6 x 6 (152 x 152)	7 (178)
8 x 8 (203 x 203)	12 (305)
10 x 10 (254 x 254)	17 (432)

*** Work plane distance is defined as the distance from output window to target plane.**

The table below shows the typical output of the Diverging Beam Solar Simulator in W/m^2.

With Air Mass Filter	Typical Output (W/m^2)			
	4 x 4 Inch	6 x 6 Inch	8 x 8 Inch	10 x 10 Inch
	250-2500 nm	250-2500 nm	250-2500 nm	250-2500 nm
AM 1 Direct	2300	770	520	340
AM 1.5 Direct	2100	700	460	310
AM 2 Direct	1980	660	440	290
AM 1.5 Global	1450	480	320	210
AM 0	2700	900	600	390
Unfiltered Irradiance	2400	1155	760	500

SPECIFICATIONS

Wattage:	1000 W
Lamp Type:	Xenon short arc
Collimation:	
For 2 x 2 inch beam:	± 6°
For 4 x 4 inch beam:	± 4°
For 6 x 6 inch beam:	± 3°
For 8 x 8 inch beam:	± 2°
Beam Uniformity:	± 5%*
Light Ripple:	< 1% r.m.s.**
Simulator Input:	190-264 VAC, 20 A, 50/60 Hz 95-132 VAC, 10 A, 50/60 Hz
Simulator Regulation:	1% over the AC input voltage range

*** ±7.5% for 81190 Diverging Beam Solar Simulator**

**** When operating an Oriel lamp at rated power in the 1000 Watt Solar Simulator housing, the lamp output may drop with age to 75% of its initial value in 900 hours. Xenon lamps require a 30 minute warm up to provide maximum stability. To ensure optimal stability regardless of lamp aging or changes in ambient temperature, we recommend our 68851 Light Intensity Controller. See page 60 for more details on Model 68851.**

ORDERING INFORMATION

Oriel 1000 Watt Solar Simulators include the illuminator housing, 1000 watt xenon arc lamp (ozone free), power supply, and necessary cables. Order filters and other optional components separately.

1000 Watt Diverging Beam Solar Simulator	**81190**
1000 Watt Solar Simulator with 2 x 2 inch (51 x 51 mm) collimated beam	**81191**
1000 Watt Solar Simulator with 4 x 4 inch (102 x 102 mm) collimated beam	**81192**
1000 Watt Solar Simulator with 6 x 6 inch (152 x 152 mm) collimated beam	**81193**
1000 Watt Solar Simulator with 8 x 8 inch (203 x 203 mm) collimated beam	**81194**

Replacement Lamps

1000 Watt Xenon Arc Lamp Ozone Free (Included with all Oriel 1000 Watt Solar Simulators)	**62710**
1000 Watt Xenon Arc Lamp UV Enhanced	**62690**

Air Mass Filters

Direct Air Mass Filter Set Includes Air Mass 0, 1, 1.5 and 2 - Direct	**81014**
Air Mass 0 (Outer Space)	**81011**
Air Mass 1 - Direct	**81011 + 81074**
Air Mass 1.5 - Direct	**81011 + 81075**
Air Mass 2 - Direct	**81011 + 81076**
Air Mass 1.5 - Global For 2 x 2 inch (51 x 51 mm) beam size	**81011 + 81074 + 81080**
Air Mass 1.5 - Global For 4 x 4 inch (102 x 102 mm) beam size	**81011 + 81074 + 81081**
Air Mass 1.5 - Global For 6 x 6 inch (152 x 152 mm) beam size	**81011 + 81074 + 81082**

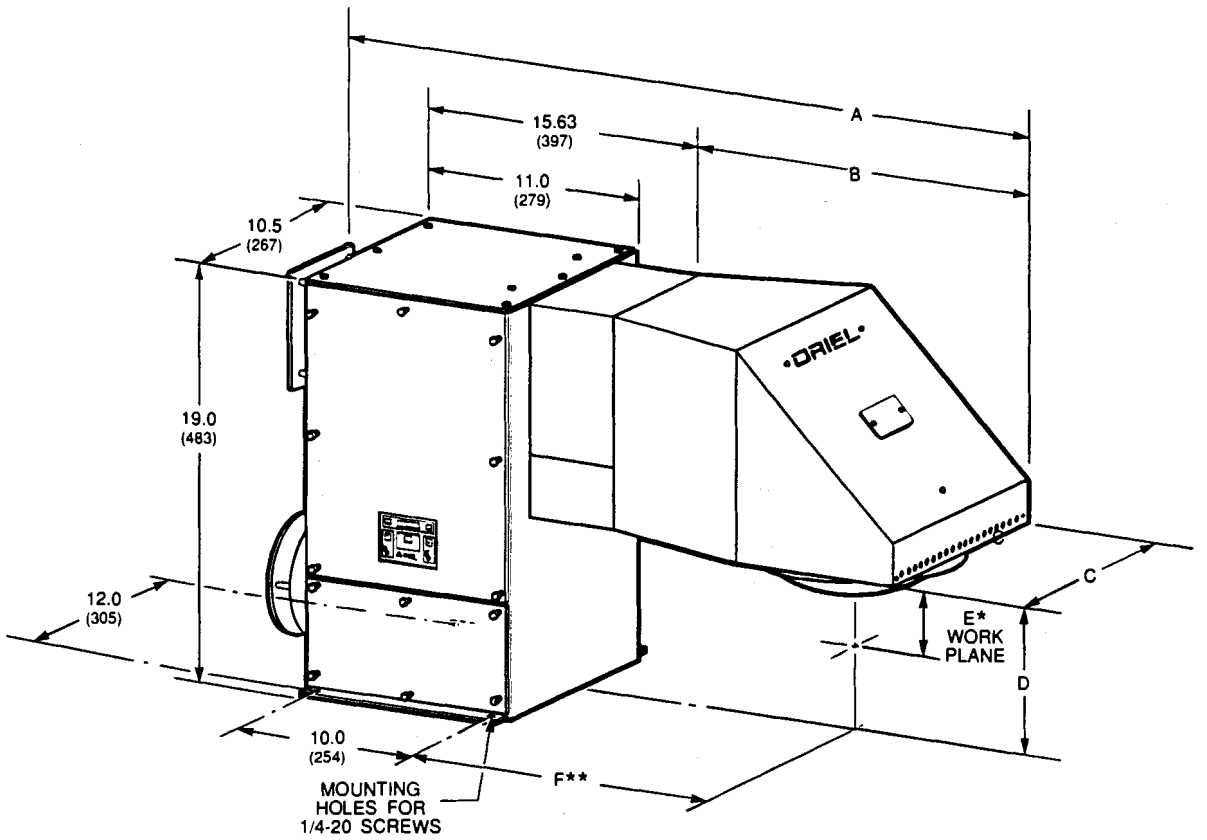
An Air Mass 1.5 - Global Filter for 8 x 8 inch (203 x 203 mm) beam size is available upon request. To order, contact Oriel's AEG Department.

The 81011 Air Mass 0 Filter is required to simulate all air masses. You only need to order it once.

Optional Components

High Flux Beam Concentrator (Usable with Model 81191 only)	**81030**
Digital Timer	**84350**
Light Intensity Controller	**68851**

See pages 59 to 65 for details on these and other optional components.



MODEL NO.	DIMENSIONS IN INCHES (mm)							
	BEAM SIZE	A	B	C	D	E* MIN.	E* MAX.	F**
81191	2x2 (51x51)	26.4 (671)	7.3 (185)	7.63 (194)	12.2 (310)	1.25 (31.8)	2.5 (64)	9.3 (236)
81192	4x4 (102x102)	30.0 (762)	10.9 (277)	8.63 (219)	8.25 (210)	2.0 (51)	4.0 (102)	11.4 (290)
81193	6x6 (152x152)	35.7 (907)	16.6 (422)	11.63 (295)	7.5 (191)	3.0 (76)	5.5 (140)	15.8 (401)
81194	8x8 (203x203)	38.3 (973)	19.13 (486)	15.5 (394)	4.63 (118)	4.0 (102)	7.0 (178)	16.38 (416)
81190	Diverging	30.0 (762)	10.9 (277)	8.63 (219)	8.25 (210)			11.4 (290)

*THE DISTANCE FROM THE VERTEX OF THE LENS TO THE WORKING PLANE.

**THE DISTANCE FROM THE CENTER OF THE BEAM PATH TO THE CENTER OF THE MOUNTING HOLE.

MINOR DIFFERENCES IN APPEARANCE EXIST AMONG THE 1000W MODELS. FOR MORE DETAILED DESCRIPTIONS, CONTACT ORIEL'S AEG DEPARTMENT.

Dimensions in inches (mm).

Fig. 4 Dimensions of the Oriel 1000 Watt Solar Simulators.

A WORD ON SAFETY. . .

These light sources produce high intensity ultraviolet radiation. Exposure to intense UV radiation can cause delayed severe burns to the eyes and skin. Proper protective eyewear and gloves should be worn at all times during operation.

See page 59 for our complete line of UV safety equipment.

See page 46 for our 1000 Watt Solar Ultraviolet Simulators. These sources simulate the UV portion of the solar spectrum with reduced VIS-IR.

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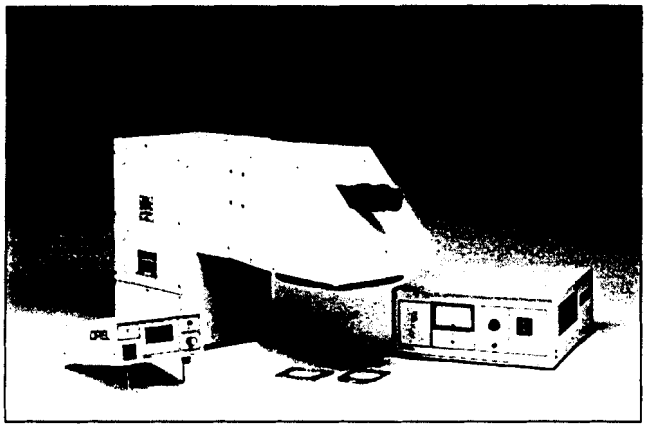

81292 Solar Ultraviolet Simulator with Power Supply, 68851 Light Intensity Controller, and UV Blocking Filters.

- **Generate intense ultraviolet radiation with minimal sample heating.**
- **Run tests when you want to. Weather conditions and time of day are no longer barriers to your research.**
- **Irradiate samples up to 8 x 8 inches (203 x 203 mm), or many smaller samples simultaneously.**
- **Optional blocking filters let you shape the UV output.**
- **Save time. Simulate hours of ultraviolet sunlight in minutes.**

Applications

- **Environmental studies - effects of the disappearing ozone layer**
- **Development of UV blocking materials**
- **Photobiological studies - SPF sunscreen testing**
- **Photodynamic therapy testing**
- **Polymer testing**
- **Materials testing**

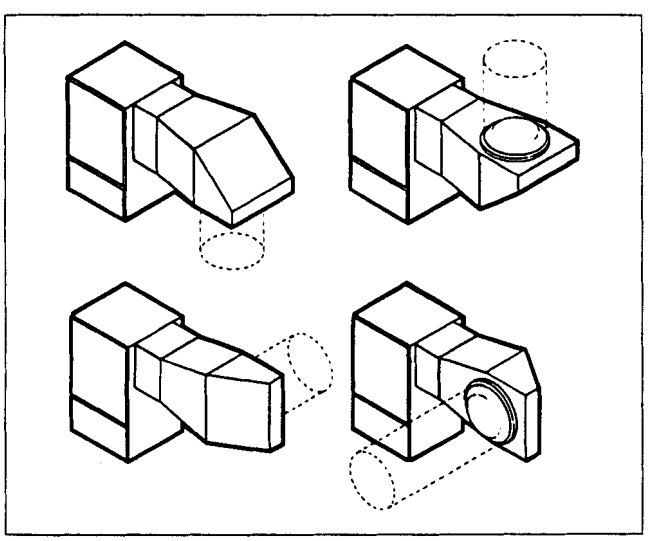

Fig. 1 81292 output beam assembly configurations.

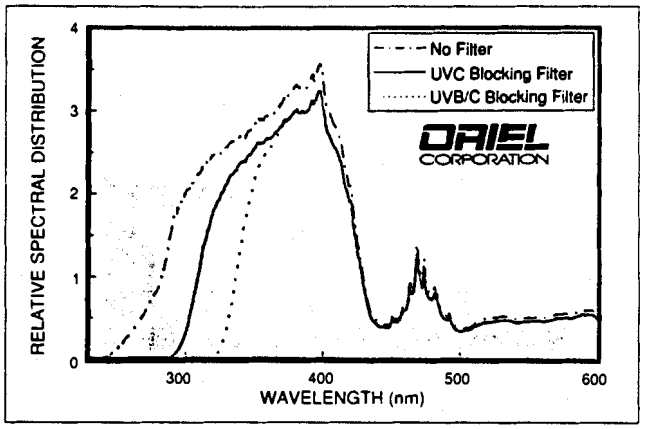

Fig. 2 Spectral output of 1000 W Solar UV Simulator, 4 x 4 inch beam size, with UV bandpass filters. Other spectra are on page 31.

If you need a high intensity UV source that closely matches the sun, with little VIS and IR, you need one of these Solar Ultraviolet Simulators. We replaced the aluminum mirror in our traditional Solar Simulators (page 37) with a dichroic mirror that passes 280 - 400 nm, and reduces the VIS to IR. Optional UV blocking filters and additional dichroic mirrors let you select the portion of the UV you need.

Our 1000 Watt Solar Ultraviolet Simulators produce highly collimated and uniform UV illumination in various beam sizes. Four different output assemblies are offered to produce a 2 x 2 inch (51 x 51 mm), 4 x 4 inch (102 x 102 mm), 6 x 6 inch (152 x 152 mm), or an 8 x 8 inch (203 x 203 mm) beam. The output assembly may be rotated 90° to give you either a horizontal or vertical beam. (Note: Due to the weight of the lens, the output assembly on the 8 x 8 inch (203 x 203 mm) model can only be positioned to produce a vertical beam. You can provide structural support, if a horizontal beam is imperative.)

For high flux applications, such as accelerated UV degradation studies, we offer the 81030 High Flux Beam Concentrator which focuses a 2 x 2 inch (51 x 51 mm) output beam down to a 0.6 inch (15 mm) diameter spot, increasing the energy density by 7 times. (Note: You cannot use it with larger area illuminators.) For more information on the Model 81030 and other accessories see pages 59 to 65.

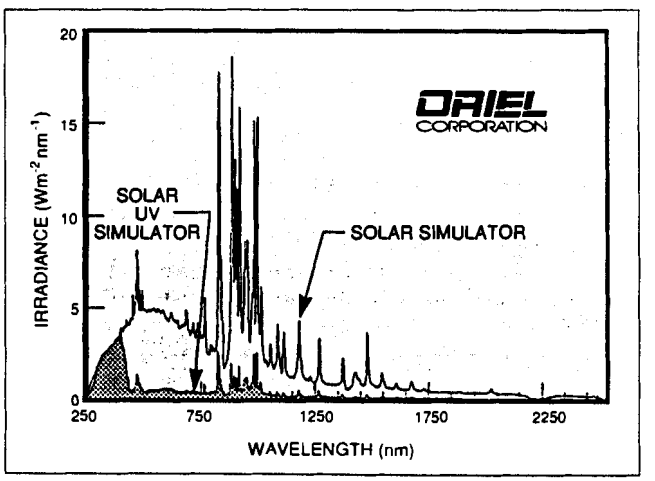

Fig. 3 Spectral output of an Oriel 1000 Watt Solar Simulator with an aluminum mirror compared to the output of a 1000 Watt Solar Ultraviolet Simulator with a dichroic mirror.

250 LONG BEACH BLVD., P.O. BOX 872, STRATFORD, CT. U.S.A. 06497 ■ (203) 377-8282 ■ FAX (203) 378-2457

WHAT MAKES UP A SOLAR ULTRAVIOLET SIMULATOR?

The Illuminator Housing

The housing is an aluminum enclosure which contains the arc lamp, arc lamp ignitor, collimating optics, light shutter, and light shutter power supply. It is equipped with a safety interlock and a thermal interlock to ensure operator and system safety. Integral fans provide forced air cooling to ensure optimal lamp temperature and to safely remove excess heat; a forced air blower cools the filter.

UVB/UVA Dichroic Mirror

These Solar UV Simulators include a dichroic mirror that passes 280 - 400 nm while greatly reducing the VIS to IR output of the lamp. You can use UV blocking filters, such as the 81017 Atmospheric Attenuation Filter, which simulates the UV edge of the sun, after the dichroic mirror.

Contact Oriel's AEG Department for our complete line of dichroic mirrors.

1000 Watt Xenon Arc Lamp

This Solar Ultraviolet Simulator comes with an ozone free xenon arc lamp which has output down to 260 nm. For applications requiring deep UV (below 260 nm), replace the ozone free lamp with our 62690 UV enhanced model.

The High Voltage Ignitor

To improve lamp start reliability and reduce E.M.I., we built the high voltage ignitor into the lamp housing. This reliable ignitor generates high voltage pulses to start the lamp.

The Power Supply

Our highly regulated Power Supply is the most dependable arc lamp power supply available. It provides constant electrical power to the lamp. A convenient preview feature reduces set up time by enabling you to set the lamp power prior to ignition. You no longer have to wait through the lamp's warm up period to establish the operating power! Our optional 68851 Light Intensity Controller interfaces directly with this supply to ensure the long term stability of the entire lamp output or that of a selected spectral region. See page 60 for more details on our Light Intensity System.

DIGITAL CONTROL PANEL

The digital control panel is visibly located on the side of the lamp housing. A variety of features have been incorporated to let you conveniently monitor and control the operation of the 1000 Watt Solar UV Simulator.

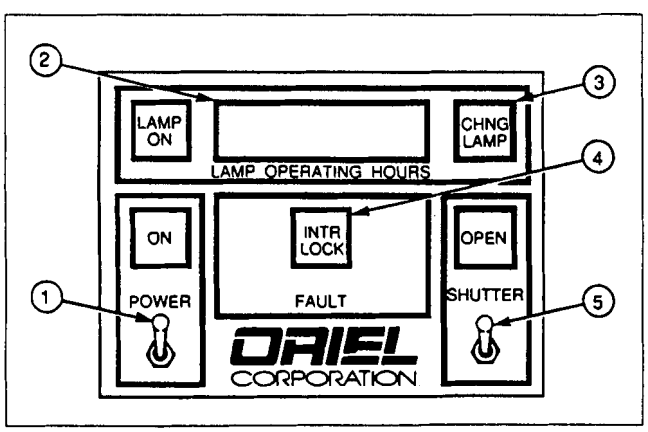

Fig. 4 Digital Control Panel.

1. **Power On/Off Switch**
   This toggle switch shuts down the housing operation and the digital display panel.
2. **Digital Elapsed Time Indicator**
   This digital display indicator provides a convenient way to monitor lamp aging. Elapsed time is recorded in 0.1 hour increments up to 10,000 hours. This indicator can be reset when the lamp is replaced. (Note: Xenon arc lamps should be replaced every 900 hours to ensure spectral fidelity. More frequent replacement is necessary to sustain high ultraviolet output.)
3. **"Change Lamp" Indicator**
   This indicator can be preset to match the recommended life of the arc lamp. After the designated time has elapsed, a red light labeled "change lamp" reminds you to replace the lamp.
4. **Fault Indicator**
   A red light labeled "interlock" provides a visual warning that a housing interlock system is "open". The entire system will automatically shut down when this occurs.
5. **Light Shutter Switch**
   This electronic shutter switch opens and closes the splitblade light shutter, as needed.

OPTICAL SYSTEM

An ellipsoidal reflector surrounds the lamp and collects more than 70% of the UV radiation produced. The radiation is focused onto an optical integrator which produces a uniform diverging beam. This beam is deflected 90° by a mirror to a final collimating lens. The output is a uniform collimated beam.

We offer 4 different collimated output beam assemblies. These produce a 2 x 2 inch (51 x 51 mm), 4 x 4 inch (102 x 102 mm), 6 x 6 inch (152 x 152 mm), or 8 x 8 inch (203 x 203 mm) beam. Each unit is laser aligned to ensure optimal beam uniformity, collimation, and intensity. See page 11 for a diagram of the optical system. (Note: A 1000 Watt Diverging Beam Solar Ultraviolet Simulator which produces a diverging beam up to 12 x 12 inches (305 x 305 mm) is available upon request. Contact our AEG Sales Department for additional information.)

MANUAL OR AUTOMATED EXPOSURE CONTROL

All Oriel Solar Simulators include an electronic splitblade shutter. You can externally control this shutter from the Digital Control Panel, a hand held switch, a contact closure, or logic level input.

For automated exposure control, our 84350 Digital Timer and our 68851 Light Intensity Controller are available. The Digital Timer lets you preset the exposure dosage needed to meet your requirements or computer command a series of exposures to measure actinic relationships. For long term exposures, we recommend the Light Intensity Controller. This intensity control system maintains a constant level of light regardless of lamp aging or changes in ambient temperature. See pages 60 to 62 for more details on our Digital Timer and Light Intensity Controller.

SAFETY INTERLOCK SYSTEM

The illuminator housing includes three interlock systems to ensure operator and system safety. An electrical interlock protects you from inadvertent exposure to the lamp, by automatically shutting down the system if the housing door is opened. A thermal interlock shuts down the system if the temperature within the housing exceeds the level required for safe operation, and a third interlock shuts off the lamp if the fan or blower fail.

ADJUSTMENTS IN BEAM POWER

The beam power is adjustable down to 25% of full power. For applications requiring a specific output intensity, see page 56 for technical information on suitable radiometric systems.

TYPICAL BEAM POWER AT FULL OUTPUT

The table below shows the typical output (W/m^2) of our 1000 Watt Solar Ultraviolet Simulator (Model 81290).

With Optional UV Filters	Typical Output (W/m^2) of 2 x 2 inch (51 x 51 mm) Solar UV Simulator		
	UVC Below 280 nm	UVB 280 - 320 nm	UVA 320 - 400 nm
Base Unit (no additional filters)	54	284	885
With Atmospheric Attenuation Filter	0	37	800
With Atmospheric* Attenuation Filter plus VIS-IR Bandpass Blocking Filter	0	31	508 8
With UVC Blocking Filter	0	109	818
With UVB/C Blocking Filter	0	0.33	643

*** For calculation purposes only. This filter combination is not available for 2 x 2 inch beam size.**

Multiply the irradiance values from the table above by the factors listed below to obtain the irradiance values for other size Oriel Solar UV Simulators.

Beam Size Inch (mm)	Model No.	Scale Factor
2 x 2 (51 x 51)	**81290**	**1.00**
4 x 4 (102 x 102)	**81291**	**0.27**
6 x 6 (152 x 152)	**81292**	**0.14**
8 x 8 (203 x 203)	**81293**	**0.085**

THE UV SPECTRUM

We talk about the UV spectrum in more detail in the Technical Discussion on page 15. Fig. 5 below shows the ultraviolet, broken into the traditional definitions of UVC, UVB, and UVA wavelength regions.

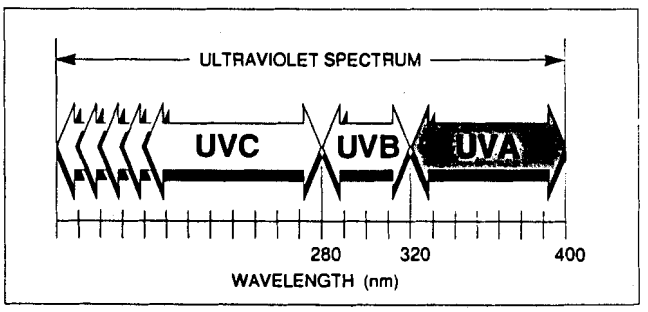

Fig. 5 The ultraviolet spectrum.

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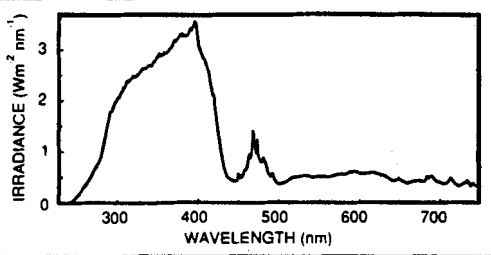
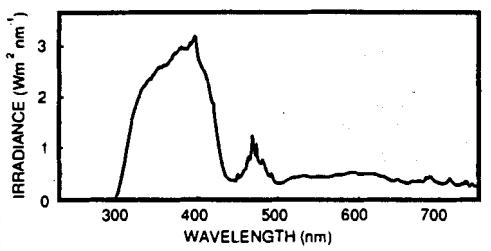
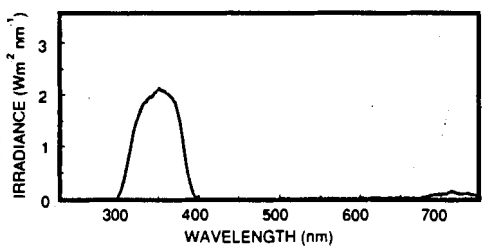
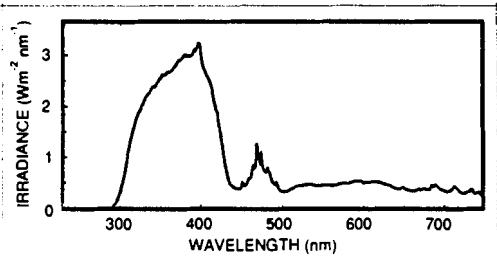
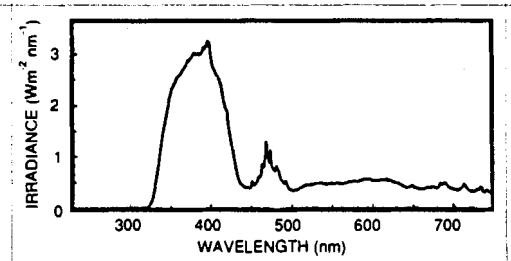
Optional Blocking Filters

We offer a wide selection of UV bandpass filters to meet almost any requirement. The table below lists the filters available and the spectral output from 230-750 nm when used with a 1000 W Solar UV Simulator. (See page 31 for typical IR output.)

For This Typical Spectral Output	With This Approximate Spectral Output Curve	Use These Components	Model No.
280-400 nm plus Residual 400-2800 nm		Base Unit (No additional components necessary.)	
290-400 nm plus Residual 400-2800 nm		Atmospheric Attenuation Filter	**81017**
290-400 nm plus Residual 650-800 nm		Atmospheric Attenuation Filter plus VIS-IR Bandpass Blocking Filter	**81017** **81019 (4 x 4 inch beam)** **81018 (6 x 6 inch beam)** **(Not available for 2 x 2 inch beam size)**
280-400 nm plus Residual 400-2800 nm		UVC Blocking Filter	**81051**
320-400 nm plus Residual 400-2800 nm		UVB/C Blocking Filter	**81050**

REQUIRE DIFFERENT FILTERS?

Call today for a FREE copy of our Optics and Filters Catalog, a 250 page valuable product and technical guide. Or, fill out the reply card at the back of this catalog and fax or mail to us.

SPECIFICATIONS

Wattage:	1000 W
Lamp Type:	Xenon short arc
Collimation:	
For 2 x 2 inch beam:	± 6°
For 4 x 4 inch beam:	± 4°
For 6 x 6 inch beam:	± 3°
For 8 x 8 inch beam:	± 2°
Beam Uniformity:	± 5%
Light Ripple:	< 1% r.m.s.*
Simulator Input:	190-264 VAC, 20 A, 50/60 Hz 95-132 VAC, 10 A, 50/60 Hz
Simulator Regulation:	1% over the AC input voltage range

*** When operating an Oriel lamp at rated power in the 1000 Watt Solar Ultraviolet Simulator housing, the lamp output may drop with age to 75% of its initial value in 900 hours. This specification is based on average visible output. The ultraviolet output drops more rapidly. Xenon lamps require a 30 minute warm up to provide maximum stability. To ensure optimal stability regardless of lamp aging or changes in ambient temperature, we recommend our 68851 Light Intensity Controller. See page 60 for more details on Model 68851.**

ORDERING INFORMATION

Oriel 1000 Watt Solar Ultraviolet Simulators include the illuminator housing, UVB/UVA (280 - 400 nm) dichroic mirror, 1000 watt xenon arc lamp (ozone free), arc lamp ignitor, power supply, and necessary cables. Order filters and other optional components separately. (Note: A 1000 Watt Diverging Beam Solar Ultraviolet Simulator is available upon request. Contact our AEG Sales Department for additional information.)

1000 Watt Solar Ultraviolet Simulator with 2 x 2 inch (51 x 51 mm) collimated beam	**81290**
1000 Watt Solar Ultraviolet Simulator with 4 x 4 inch (102 x 102 mm) collimated beam	**81291**
1000 Watt Solar Ultraviolet Simulator with 6 x 6 inch (152 x 152 mm) collimated beam	**81292**
1000 Watt Solar Ultraviolet Simulator with 8 x 8 inch (203 x 203 mm) collimated beam	**81293**

Replacement Lamps

1000 Watt Xenon Arc Lamp Ozone Free (Included with all Oriel 1000 Watt Solar Ultraviolet Simulators)	**62710**
1000 Watt Xenon Arc Lamp UV Enhanced	**62690**

Replacement Dichroic Mirror

UVB/UVA Dichroic Mirror (280 - 400 nm) (Included with all Oriel 1000 Watt Solar Ultraviolet Simulators)	**81035**

For other dichroic mirrors, contact Oriel's AEG Department.

UV Filters

UVC Blocking Filter	**81051**
UVB/C Blocking Filter	**81050**
Atmospheric Attenuation Filter	**81017**
VIS-IR Bandpass Blocking Filter Assembly For 4 x 4 inch (102 x 102 mm) beam size (Includes mounting hardware)	**81019**
VIS-IR Bandpass Blocking Filter Assembly For 6 x 6 inch (152 x 152 mm) beam size (Includes mounting hardware)	**81018**

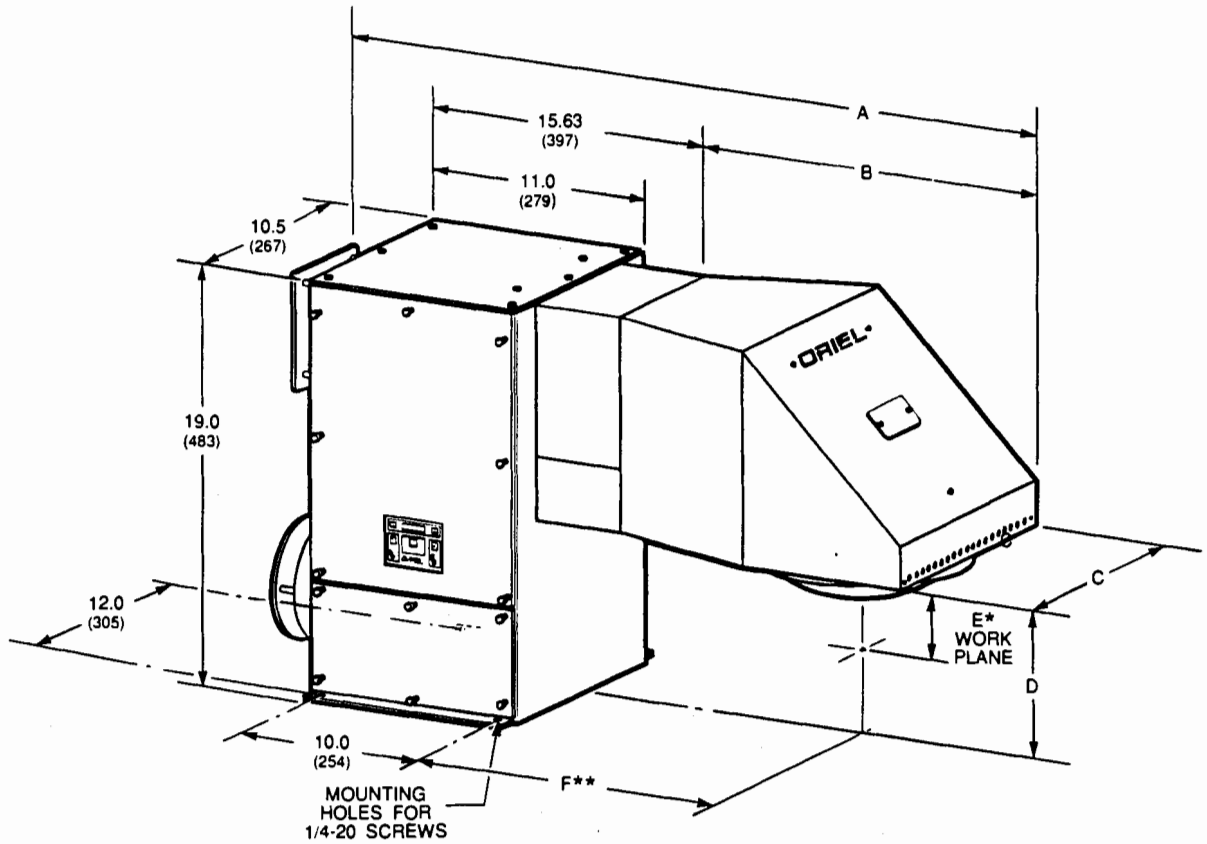
A VIS-IR Bandpass Blocking Filter for 8 x 8 inch (203 x 203 mm) beam size is available upon request. To order, contact Oriel's AEG Department.

Optional Components

High Flux Beam Concentrator (Usable with Model 81290 only)	**81030**
Digital Timer	**84350**
Light Intensity Controller	**68851**

See pages 59 to 65 for details on these and other optional components.

Beam apertures are available to attenuate the light output. Contact the AEG Sales Department for information.



MODEL NO.	DIMENSIONS IN INCHES (mm)							
	BEAM SIZE	A	B	C	D	E* MIN.	E* MAX.	F**
81290	2x2 (51x51)	26.4 (671)	7.3 (185)	7.63 (194)	12.2 (310)	1.25 (31.8)	2.5 (64)	9.3 (236)
81291	4x4 (102x102)	30.0 (762)	10.9 (277)	8.63 (219)	8.25 (210)	2.0 (51)	4.0 (102)	11.4 (290)
81292	6x6 (152x152)	35.7 (907)	16.6 (422)	11.63 (295)	7.5 (191)	3.0 (76)	5.5 (140)	15.8 (401)
81293	8x8 (203x203)	38.3 (973)	19.13 (486)	15.5 (394)	4.63 (118)	4.0 (102)	7.0 (178)	16.38 (416)

E* THE DISTANCE FROM THE VERTEX OF THE LENS TO THE WORKING PLANE.

F** THE DISTANCE FROM THE CENTER OF THE BEAM PATH TO THE CENTER OF THE MOUNTING HOLE.

MINOR DIFFERENCES IN APPEARANCE EXIST AMONG THE 1000W MODELS. FOR MORE DETAILED DESCRIPTIONS, CONTACT ORIEL'S AEG DEPARTMENT.

Dimensions in inches (mm).

Fig. 6 Dimensions of the Oriel 1000 Watt Solar Ultraviolet Simulators.

A WORD ON SAFETY. . .

These light sources produce high intensity ultraviolet radiation. Exposure to intense UV radiation can cause delayed severe burns to the eyes and skin. Proper protective eyewear and gloves should be worn at all times during operation.

See page 59 for our complete line of UV safety equipment.

XIII. DRAWINGS AND SCHEMATICS

1.)	Lamp Housing	-	81190-3-1001 81190-3-1011 81190-3-1021

WARRANTY AND RETURNS

WARRANTY

Oriel Instruments warrants that all goods described in this manual (except consumables such as lamps, bulbs, filters, ellipses, etc.) shall be free from defects in material and workmanship. Such defects must become apparent within the following period:

1. All products described here, except spare and repaired parts: one (1) year or 3000 hours of operation, whichever comes first, after delivery of the goods to buyer.

2. Spare parts: ninety (90) days after delivery of goods to buyer.

3. Repaired items: ninety (90) days after delivery of goods to buyer.

Oriel Instruments' liability under this warranty is limited to the adjustment, repair and/or replacement of the defective part(s). During the above listed warranty period, Oriel Instruments shall provide all materials to accomplish the repaired adjustment, repair or replacement. Oriel Instruments shall provide the labor required during the above listed warranty period to adjust, repair and/or replace the defective goods at no cost to the buyer ONLY IF the defective goods are returned, freight prepaid, to an Oriel Instruments designated facility.

Oriel Instruments shall be relieved of all obligations and liability under this warranty if:

1. The user operates the device with any accessory, equipment or part not specifically approved or manufactured or specified by Oriel Instruments unless buyer furnishes reasonable evidence that such installations were not a cause of the defect.

2. The goods are not operated or maintained in accordance with Oriel's instructions and specifications.

3. The goods have been repaired, altered or modified by other than Oriel authorized personnel.

4. Buyer does not return the defective goods, freight prepaid, to an Oriel repair facility within the applicable warranty period.

IT IS EXPRESSLY AGREED THAT THIS WARRANTY SHALL REPLACE ALL WARRANTIES OF FITNESS AND MERCHANTABILITY. BUYER HEREBY WAIVES ALL OTHER WARRANTIES, GUARANTIES, CONDITIONS OR LIABILITIES, EXPRESSED OR IMPLIED, ARISING BY LAW OR OTHERWISE, WHETHER OR NOT OCCASIONED BY ORIEL'S NEGLIGENCE.

This warranty shall not be extended, altered or varied except by a written document signed by both parties. If any portion of this agreement is invalidated, the remainder of the agreement shall remain in full force and effect.

CONSEQUENTIAL DAMAGES -

Oriel Instruments shall not be responsible for consequential damages resulting from misfunctions or malfunctions of the goods described in this manual. Oriel's total responsibility is limited to repairing or replacing the misfunctioning or malfunctioning goods under the terms and conditions of the above described warranty.

INSURANCE -

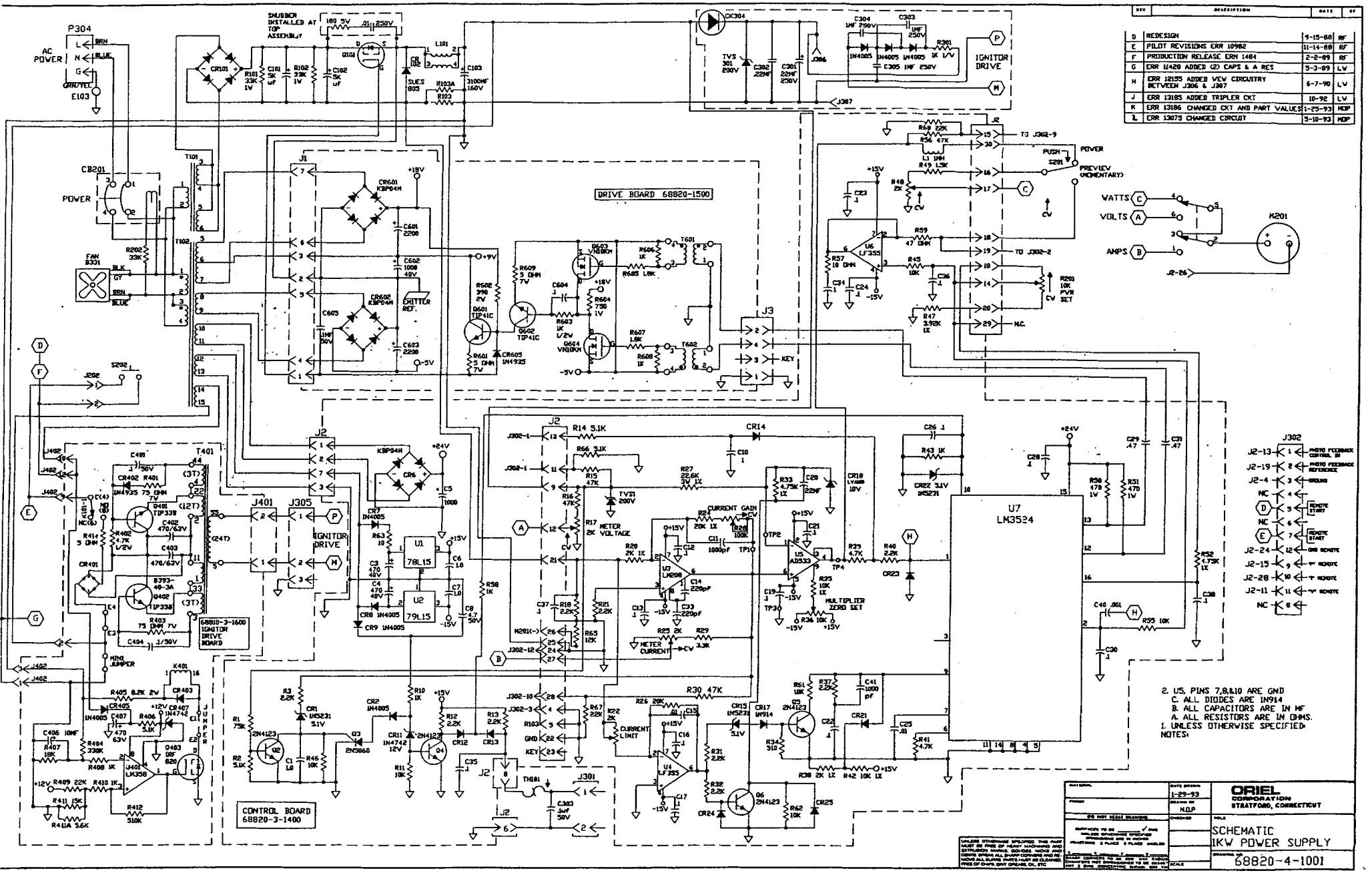
Persons receiving goods for demonstrations, demo loan, temporary use or in any manner in which title is not transferred from Oriel, shall assume full responsibility for any and all damage to the goods while they are in their care, custody and control. If damage occurs which is unrelated to the proper and warranted use and performance of the goods, then the recipient of the goods accepts full responsibility for restoring the goods to their condition upon original delivery, and for assuming all costs and charges.

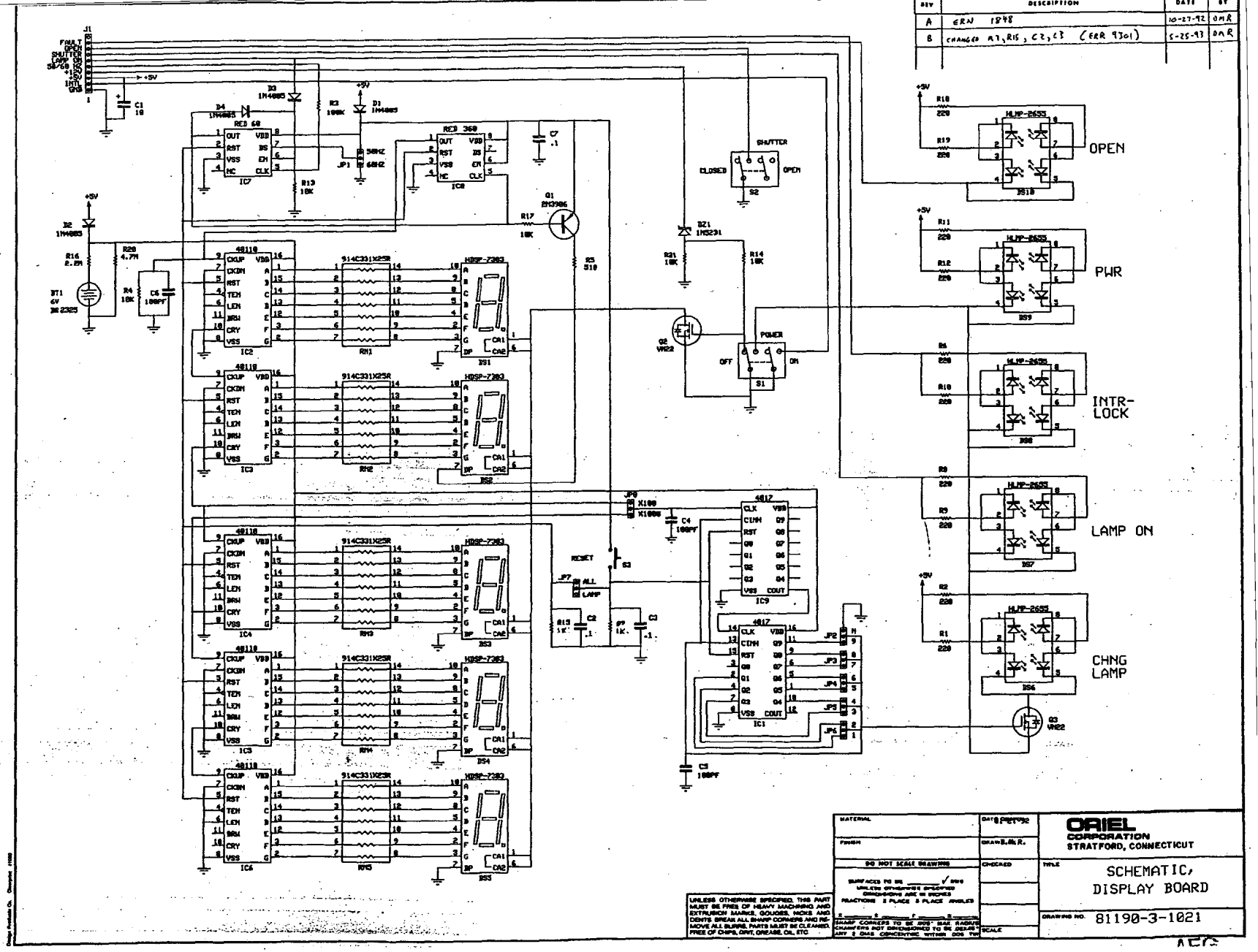
RETURNS

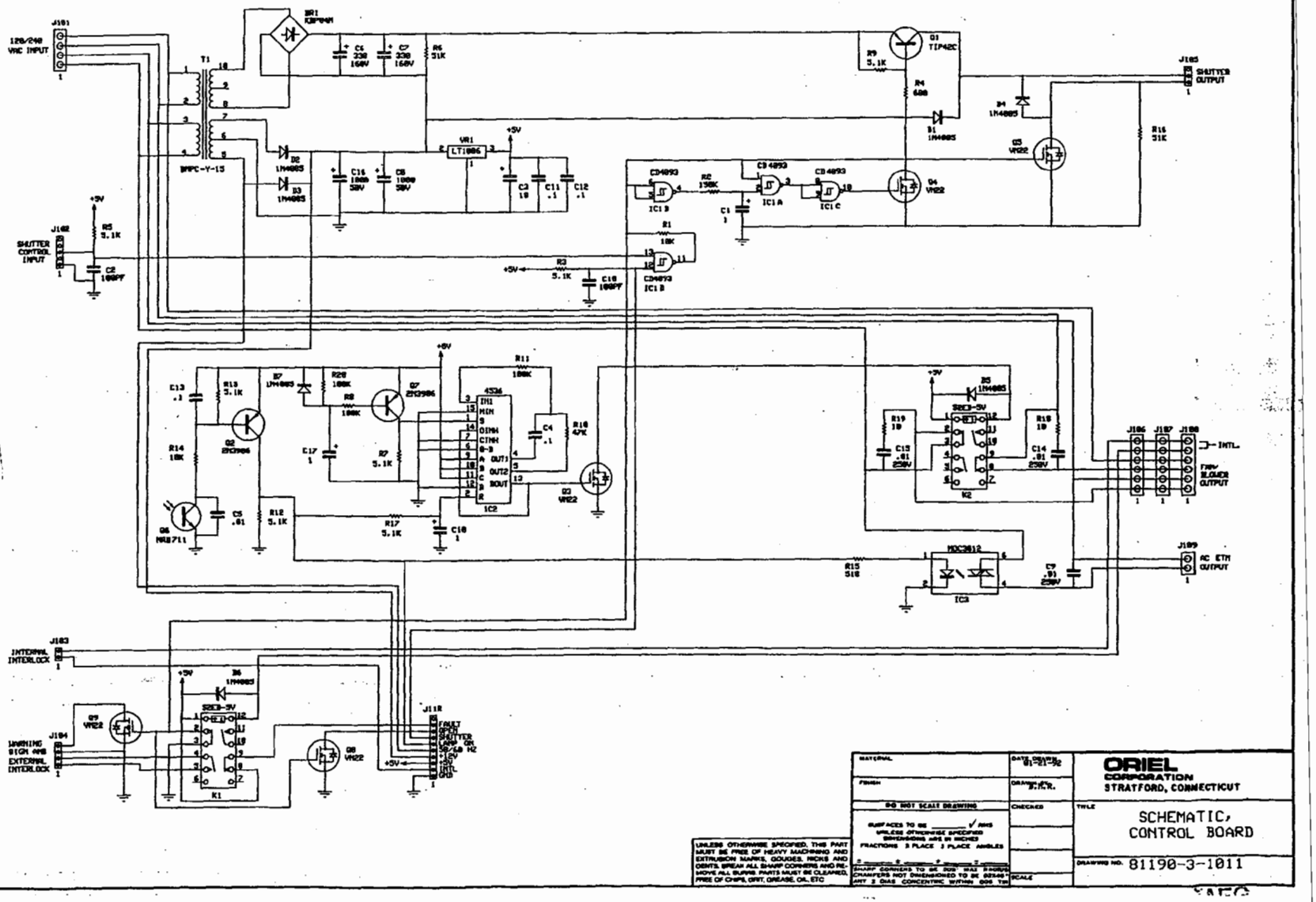
Before returning equipment to Oriel for repair, please call the Customer Service Department at (203) 377-8282. Have your purchase order number available before calling Oriel. The Customer Service Representative will give you a Return Material Authorization number (RMA). Having an RMA will shorten the time required for the repair, because it ensures that your equipment will be properly processed. Write the RMA on the returned equipment's box. Equipment returned without a RMA may be rejected by the Oriel Receiving Department. Equipment returned under warranty will be returned with no charge for the repair or shipping. Oriel will notify you of the cost of repairs not covered by warranty before starting out of warranty repairs.

Please return equipment in the original (or equivalent) packaging. You will be responsible for damage incurred from inadequate packaging, if the original packaging is not used.

Include the cables, connector caps and antistatic materials sent and/or used with the equipment, so that Oriel can verify correct operation of these accessories.


P304
AC POWER
L BRN
N BLUE
G GRN/YEL
E103
SNUBBER INSTALLED AT TOP ASSEMBLY
CR101
R101 33K 1W
C101 .5K uF
R102 33K 1W
C102 .5K uF
Q101
SUES 803
L101
CR 102
R103A
R103
C103 3100MF 160V
CK304
TVS 301 200V
C302 .22MF
C301 22MF 250V
J306
C304 1MF 250V
C303 1MF 250V
1N4005
1N4005
1N4005
C305 1MF 250V
R301 1K 1/2W
IGNITOR DRIVE
P
M
J307
REV
DESCRIPTION
DATE
BY
D REDESIGN 9-15-88 RF
E PILOT REVISIONS ERR 10982 11-14-88 RF
F PRODUCTION RELEASE ERN 1484 2-2-89 RF
G ERR U428 ADDED (2) CAPS & A RES 5-3-89 LV
H ERR 12155 ADDED VCV CIRCUITRY BETWEEN J306 & J307 6-7-90 LV
J ERR 13185 ADDED TRIPLER CKT 10-92 LV
K ERR 13186 CHANGED CKT AND PART VALUES 1-25-93 MDP
L ERR 13075 CHANGED CIRCUIT 5-10-93 MDP
CB201
POWER
FAN 8331
BLK
GRN
BRN
BLUE
T101
T102
J1
CR601 KBP04M
+18V
C601 2200
C602 1000 40V
CR602 KBP04M
C605
1MF 50V
C603 2200
-5V
CRITTER REF.
DRIVE BOARD 68820-1500
R602 390 2W
D601 TIP41C
R601 5 OHM 7W
CR605 1N4935
R609 5 OHM 7W
Q602 TIP41C
C604 1
Q603 VN10KM
R606 1K
R605 1.8K
R604 750 1W
R603 1K 1/2W
Q604 VN10KM
R607 1.8K
R608 1K
T601
T602
J3
KEY
J2
R68 22K
R56 47K
TO J302-9
L1 1MH
R49 1.5K
POWER
PUSH S201
PREVIEW (MOMENTARY)
+15V
R48 2K CV
C23 .1
U6 LF353
R59 47 OHM
R57 10 OHM
R45 10K
C36 .1
C34 .1
C24 .1
-15V
R203 10K PWR SET CV
R47 3.92K 1%
TO J302-2
N.C.
WATTS C
VOLTS A
AMPS B
M201
J2-26
J302
J2-13 PHOTO FEEDBACK CONTROL SI
J2-19 PHOTO FEEDBACK REFERENCE
J2-4 GROUND
NC
D REMOTE START
NC
E REMOTE START
J2-24 GND REMOTE
J2-15 REMOTE
J2-28 REMOTE
J2-11 REMOTE
NC
J302
S202
J401
J305
T401
C401 50V
CR402 1N4935
R401 73 OHM 7W
(3T)
Q401 TIP33B
(12T)
C402 470/63V
C403 470/63V
(24T)
R411 5 OHM 1/2W
R402 4.7K 1/2W
CR401
B393-40-3A
Q402 TIP33B
(3T)
R403 73 OHM 7W
C404 1/50V
68810-3-1600 IGNITOR DRIVE BOARD
IGNITOR DRIVE
MINI JUMPER
K401
CR405 1N4005
R405 8.2K 2W
CR403
+12V
CR407 1N4742
C407 470 63V
R406 5.6K
C406 10MF
R407 18K
R404 330K
R408 1K
Q403 VRF 820
U401 LM358
R409 22K
R410 1K
R411 15K
R411A 5.6K
R412 510K
JUMPER
J2
KBP04M
CR6
+24V
C5 1000
CR7 1N4005
U1 78L15
C6 1.0
C3 470 40V
C4 470 40V
U2 79L15
C7 1.0
C8 4.7 50V
-15V
CR8 1N4005
CR9 1N4005
R58 1K
R63 10
+15V
J302-1
R14 5.1K
R66 5.1K
R15 47K
R16 47K
R17 METER VOLTAGE 2K
TVS1 200V
CR14
C10 1
R27 22.6K 3W 1%
R24 CURRENT GAIN 20K 1%
R26 100K
C11 1000pF
TP10
R20 2K 1%
C12
U3 LM208
C14 220pF
C13
C33 220pF
R25 2K
R29 3.3K
METER CURRENT
CV
J302-12
M201(-)
R21 2.2K
R65 12K
C37 .1
R18 2.2K
R33 4.75K 1%
C28 220F
CR18 LV400 10V
+15V
C21 .1
TP2
U5 AD533
TP4
R35 10K 1%
MULTIPLIER ZERO SET
R36 10K
C19 .1
TP3
R39 4.7K 1%
R40 2.2K
CR23
H
U7 LM3524
C26 .1
R43 1K
CR22 3.1V 1N5231
+24V
C28 .1
C29 .47
C31 .47
R30 470 1W
R31 470 1W
R52 1.75K 1%
C38 .1
C40 .001
R55 10K
C30 .1
R30 47K
J302-10
J302-3
R103
GND
KEY
R67 22K
R22 2K
CURRENT LIMIT
R26 20K
C15
C16 .1
U4 LF353
C17 .1
-15V
R31 2.2K
R32 2.2K
Q6 2N4123
CR24
R62 10K
CR25
CR15 1N5231 5.1V
CR17 1N914
Q5 2N4123
C22 .1
CR21
R34 510
R61 10K
R37 2.2K
C41 1000 pF
R38 2K 1%
R42 10K 1%
+15V
C25 .01
R41 4.7K
R1 75K
2N4123 Q2
R2 5.1K
C1 1.0
R46 10K
CR1 1N5231 5.1V
R3 2.2K
CR2 1N4005
Q3 2N5060
R10 1K
CR11 1N4742 12V
2N4123 Q4
R12 2.2K
CR12
R13 2.2K
CR13
R11 10K
C35 .1
J2
6
TH101
J301
1
C303 1MF 50V
2
CONTROL BOARD 68820-3-1400
2. US, PINS 7,8,&10 ARE GND
C. ALL DIODES ARE 1N914
B. ALL CAPACITORS ARE IN MF
A. ALL RESISTORS ARE IN OHMS.
1. UNLESS OTHERWISE SPECIFIED
NOTES:
MATERIAL
FINISH
DO NOT SCALE DRAWING
DATE DRAWN 1-29-93
DRAWN BY M.D.P.
CHECKED
ORIEL CORPORATION STRATFORD, CONNECTICUT
TITLE
SCHEMATIC 1KW POWER SUPPLY
DRAWING NO. 68820-4-1001
SCALE


REV | DESCRIPTION | DATE | BY
A | ERN 1848 | 10-27-92 | DMR
B | CHANGED R7, R15, C2, C3 (ERR 9301) | 5-25-93 | DMR
OPEN
PWR
INTR-LOCK
LAMP ON
CHNG LAMP
SHUTTER
POWER
RESET
MATERIAL
FINISH
DO NOT SCALE DRAWING
DRAWN E.M.R.
CHECKED
SCALE
DATE 8 OCT 92
ORIEL CORPORATION
STRATFORD, CONNECTICUT
TITLE SCHEMATIC, DISPLAY BOARD
DRAWING NO. 81190-3-1021



REV	DESCRIPTION	DATE	BY

UNLESS OTHERWISE SPECIFIED, THIS PART MUST BE FREE OF HEAVY MACHINING AND EXTRUSION MARKS, GOUGES, INICKS AND DENTS. BREAK ALL SHARP CORNERS AND REMOVE ALL BURRS. PARTS MUST BE CLEANED, FREE OF CHIPS, GRIT, GREASE, OIL, ETC

MATERIAL	
FINISH	
DO NOT SCALE DRAWING	
SURFACES TO BE ____ ✓ RMS UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES FRACTIONS 3 PLACE 2 PLACE ANGLES	
SHARP CORNERS TO BE .005" MAX RADIUS. CHAMFERS NOT DIMENSIONED TO BE .025x45° ANY 2 DIAS CONCENTRIC WITHIN .005 TIR	
DATE DRAWN 01-21-92	
DRAWN B.K.R.	
CHECKED	
SCALE	

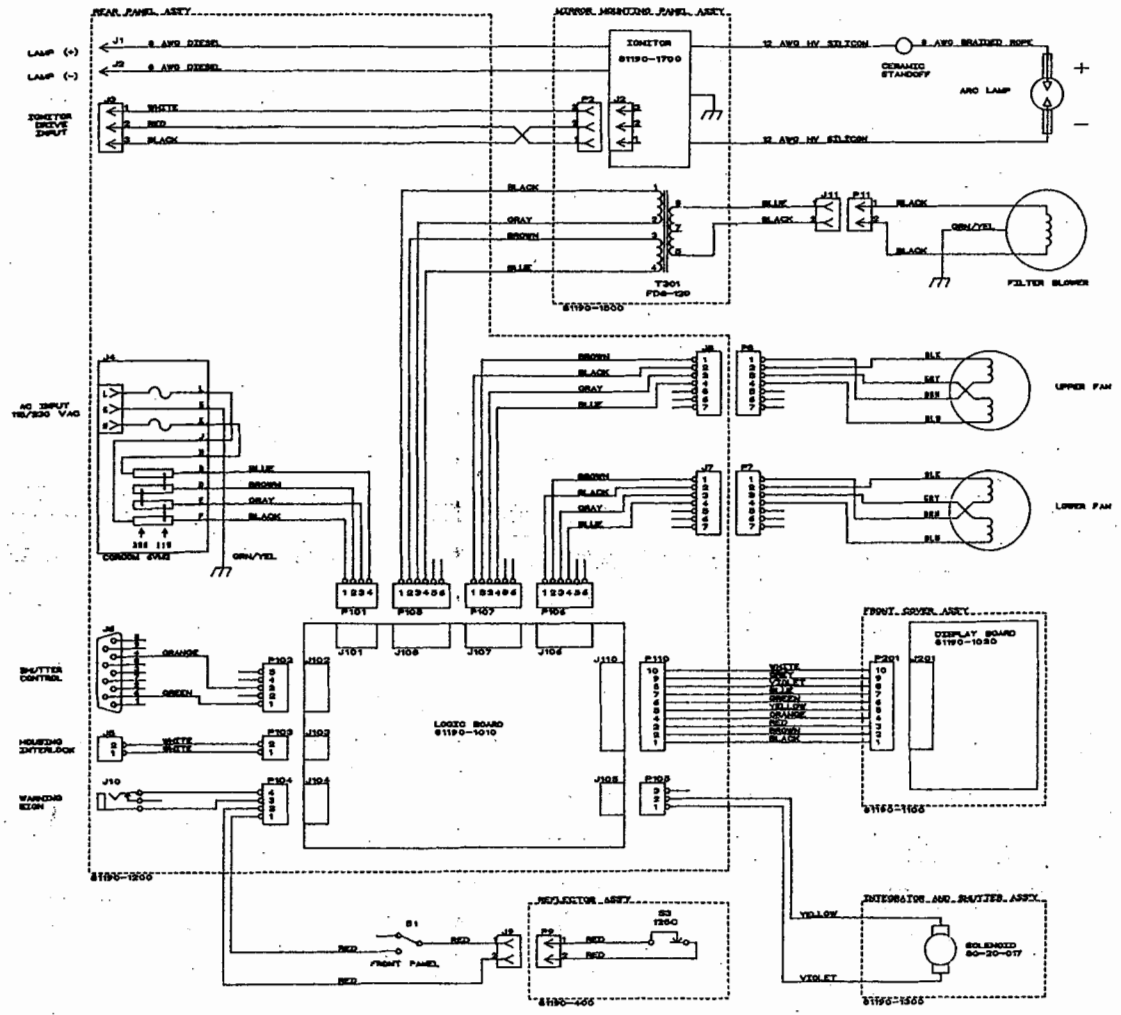
ORIEL CORPORATION
STRATFORD, CONNECTICUT

TITLE: SCHEMATIC, CONTROL BOARD

DRAWING NO. 81190-3-1011

AEG

REV.	DESCRIPTION	DATE	BY
A	PRODUCTION RELEASE P848	10-27-92	DMR
B	REDESIGN, ECR#13507	9-13-93	DMR



NOTES:

1. UNLESS OTHERWISE SPECIFIED, ALL HOOKUP WIRE IS 22 AWG TEFLON.

ORIEL CORPORATION
250 LONG BEACH BLVD.
STRATFORD, CT 06497
(203) 377-8282

Title: SYSTEM SCHEMATIC

Size: D | Document Number: 81190-3-1001 | REV: A

Date: September 13, 1993 | Sheet 1 of 1

AEG