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68830-M

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RADIOMETRIC POWER SUPPLY

MODEL 68830

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

INTRODUCTION

The Oriel model 68830 power supply was designed to meet the needs of the researcher who demands a highly regulated source of high current for proper operation of light sources. These sources are from tungsten lamps for VIS–NIR radiation or from ceramic glowers for IR radiation. Constant current operation of these sources of radiation is required whenever a radiometric measurement is being made or whenever a highly stable light output is needed.

The light sources will be operated in constant current mode by the Oriel Model 68830 power supply with the output voltage being dependent on the load's impedance. A constant current power supply regulates current even into a short circuit, and the model 68830 is such a power supply. It is also safely limited to *20 amperes or 300 watts.* Any resistive load which operates between 0–20 amperes and 0–50 volts, and dissipates less than 300 watts may be connected to the 68830 power supply.

The following Oriel lamps may be operated with the model 68830 Constant Current Supply:

MODEL	DESCRIPTION
6318	10 watt QTH
6319	20 watt QTH
6332	50 watt QTH
6337	50 watt QTH
6333	100 watt QTH
6334	250 watt QTH
6373	140 watt Infrared Emitter
6575	55 watt Ceramic Element

The Oriel model 68830 does not only provide a controlled source of current to such a wide variety of loads. It also contains circuitry to allow for viewing the output current, the output voltage, and the output power. There is provision for remote monitoring of these output parameters. Remote capability also includes an input for external control, modulation, or photofeedback.

The 68830 Radiometric Power Supply was designed to be a reliable and efficient source of direct current. The main power supply section uses off–line switching technology with the resultant increase in power conversion efficiency, reduction in weight, and wide input mains operation.

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II

SPECIFICATIONS

13

AC Mains Input:	95 - 135 VAC @ 8 amperes 135 - 270 VAC @ 4 amperes 50 or 60 Hertz
DC Power Output:	300 watts maximum
DC Current Output:	Adjustable from 0.5 - 20 amperes Current limit at 24 amperes
DC Voltage Output:	Nominally 50 volts unloaded. The loaded output voltage range is load dependant from 0 - 50 volts. The total output power must not exceed 300 watts.
Light Output Ripple:	Typically 0.05% R.M.S.
Pre-Adjust Accuracy:	2%
Power Meter Accuracy:	2%
Line Regulation:	± 0.1% for 95 - 135 VAC mains or for 190 - 235 VAC mains input
Ambient Temperature:	0° - 40°C

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III
CONTROLS AND CONNECTIONS

This section will describe the various controls, the available connections, and their function. *Please become familiar with their uses before operating the power supply with any lamps.* This will reduce the possibility of damaging the power supply or the lamps through improper operation.

Front Panel

Figure 3–1 shows the location and labels for the front panel.

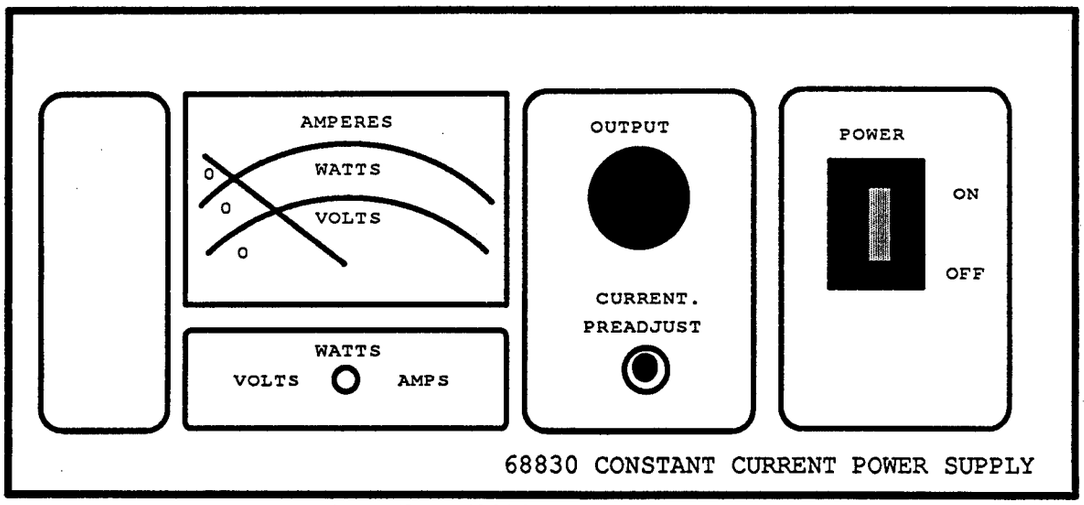


Figure 3-1 68830 Front Panel Layout

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Meter and Voltage, Watts, and Amps Switch

The analog meter is scaled to display the output voltage, current, and wattage. Keep in mind two (2) items when monitoring this indicator; *1) the meter monitors the output of the supply not the load, and 2) output power is always displayed by the meter.* The select switch enables you to momentarily view the output voltage or current by pressing it left or right, respectively.

Output and Current Preadjust Switch

A ten turn potentiometer is used to provide a precise means of output current adjustment. A shaft lock is mounted with this knob to lock in a setting if a readjustment from a previous current setting is not desired. The preadjust switch is useful in presetting the output current when the power supply is on but, before a load is connected to it.

Power Switch

This is the AC mains power switch, and circuit breaker. In the "ON" position ac power will be switched into the main circuitry of the power supply, and an integral indicator lamp will glow to indicate that the power supply is on.

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Rear Panel

Figure 3–2 shows the rear panel layout and connections.

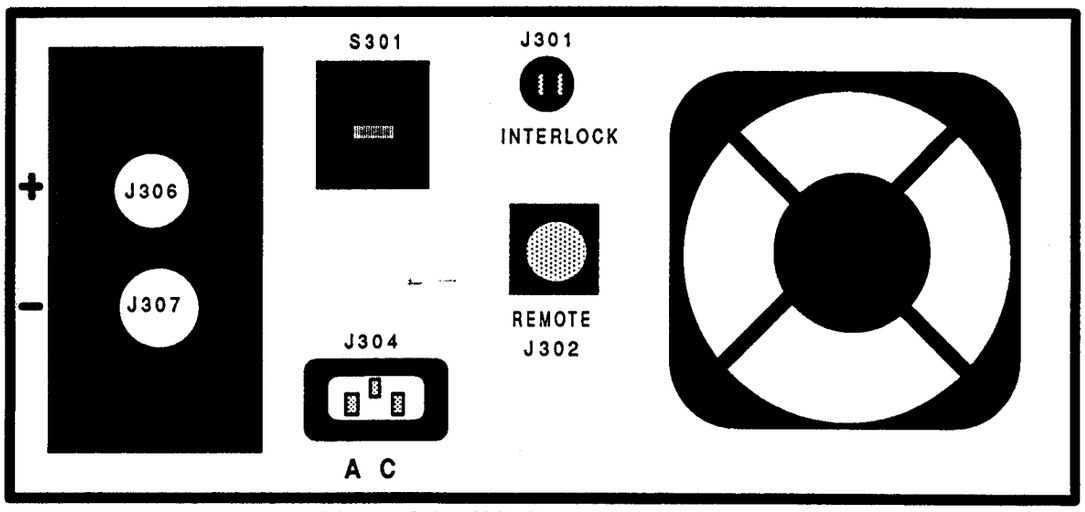


Figure 3-2 68830 Rear Panel Layout

AC Mains Input (J304)

J304 is an IEC style socket which will accept power cords for worldwide use of the power supply. The AC mains cord is connected here.

Line Voltage Selector (S301)

S301 sets the input voltage range for a nominal 110 VAC or 220 VAC. It is factory preset for your area, but should be checked before using the power supply.

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Interlock Socket (J301)

This connection must be made otherwise the main power supply will not turn on. ORIEL normally ships a shorting plug which mates to this socket. Lamp housings available through ORIEL also use this connection as a safety against accidental opening of access doors or against an excessive temperature rise within the lamp housing.

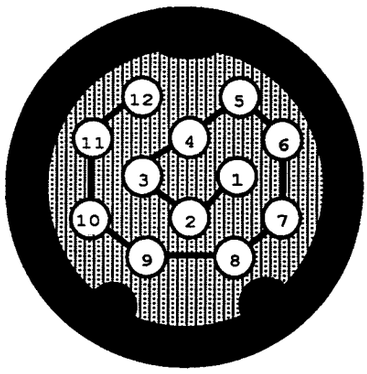
DC Output Connections (J306 and J307)

These two banana plug style connectors are the connections for the main DC output to the load. J306 is the positive, and J307 is the negative. Both are earth ground isolated. *Never make any electrical connections to these with the power supply on.*

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Remote Connector (J302)

Access to the internal metering, and control signals is provided through this connector. It is a twelve (12) pin circular connector with the following pin assignments:



J302

Remote Output Connector Pin Assignment

Pin 1	External control input. A 0–5 volt DC signal will decrease the output current from the operating level to no output, if need be.
Pin 2	Internal reference output. A 0–5 volt DC level which is proportional to the output current. This signal should be buffered with a unity gain amplifier if it is going to be used.
Pin 3	Input control and reference output common.
Pin 4	Not used.
Pin 5	115 VAC output. A low current, non isolated voltage primarily used by ORIEL controllers.
Pin 6	Not used.
Pin 7	115 VAC output. A low current, non isolated voltage primarily used by ORIEL controllers.
Pin 8	Not used.
Pin 9	Remote meter output: Power.
Pin 10	Remote meter output: Current.
Pin 11	Remote meter output: Voltage.
Pin 12	Remote meter output: Common.

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IV

USING THE POWER SUPPLY

Safety Notes:

Connections to or from any electrical device must never be made while the device is on.

The Oriel model 68830 Power Supply is such a device. It has an open circuit voltage of 50 volts and could be dangerous if care is not exercised when the power supply is on.

Please follow these precautions when operating the power supply:

Make all input and output connections before turning the power supply on.

Do not use the power supply without its cover.

Ensure that the output terminals are properly connected to the lamp housing or lamp socket before turning on the power supply.

Don't open the power supply or disconnect the output leads while the power supply is on.

Follow the lamp or lamp house manufacturer's recommendations and precautions when handling and using lamps.

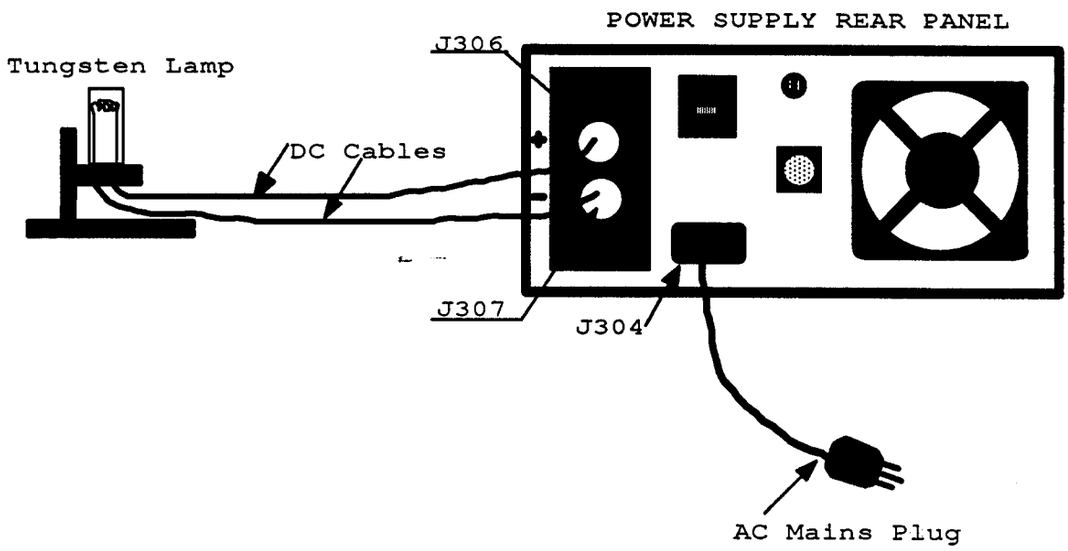
Never touch the lamp envelope or element with uncovered fingers. Definitely not when operating or immediately after shutdown, but also during installation.

Do not turn on the power supply with the output control set above the current rating for the lamp.

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Setup and Use

Please refer to Figure 4–1 for a typical lamp to power supply connection.



Typical connections to the Model 68830 power supply

The Radiometric Power Supply was designed for ease of use with a wide variety of light sources. Please follow the above precautions, and the following procedures to use the power supply safely.

Open Circuit Setup

If the lamp operating current is unknown, then determine the current setting by using Ohm's Law: amperes = power ÷ volts.

Check that the line voltage selector is in the proper position for operation in your area. Connect the line cord to the IEC socket, and plug the unit into an AC outlet.

Ensure that the "OUTPUT" control knob is full counter–clockwise. Turn on the power supply and rotate the control knob at least a 1/4 turn clockwise. Place the meter select switch to "VOLTS" and observe that the output is ≈ 50 volts DC. Release the meter switch.

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Press the "PREADJUST" switch. Read the meter display on the ampere scale. This is the output current which will be delivered to the load. Turn the "OUTPUT" knob while pressing the "PREADJUST" switch to set and view the desired operating current. This step is necessary only when initially operating the power supply or whenever a new lamp with a lower operating current is going to be used.

Note: If the previous steps are not followed damage to the lamp will occur because of the possible higher operating current setting of the "OUTPUT" knob.

OPERATION WITH LAMPS

Make all connections from the two output connectors to the light source socket with the cables that were provided. All lamp sockets available from ORIEL will mate to the output connectors. If an interlock cable is available. then connect this to the interlock socket. Otherwise, use the jumper plug that was shipped with the power supply. The interlock operates by interrupting a 24 VAC line to an internal relay. Therefore, this must be a jumper or contact closure.

Switch on the power supply. Power will now be delivered to the load, and the meter will display this value. To view the output voltage or current simply place the momentary contact meter select switch to the respective position, and monitor the appropriate scale.

When the power supply is shut off and restarted at another time the output current will be the value that has now been set. This will not need readjustment, especially if the outer ring of the "ADJUST" knob has been turned clockwise to the "LOCK" position.

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V

APPLICATIONS

Standard Lamps

The Oriel model 68830 power supply is an excellent tool for radiometric applications. Most standard lamps are calibrated with a constant current source as specified by NIST. The calibration data is valid when the lamp is operated at the current level used by the calibration laboratory. The model 68830 will operate all light sources which have operating currents of less than 20 amperes, and voltages of less than 50 volts. The product of voltage and current must not exceed the supply's 300 watt power limit. A lamp that is out of this range will not damage the power supply, but the lamp will either not operate correctly or be damaged.

Connections are the same as shown in figure 4–1, and startup is as outlined in section IV. Simply set the operating current on the power supply; shut the unit off and connect the lamp. When the power supply is turned on the lamp will receive the set current. This value will remain constant over long periods of time. Minor adjustments may be required due to load changes over the life of the lamp.

The power supply incorporates an active slow start circuit to ramp up the output current when the power switch is turned on. This is in effect whenever the supply is shut off and then turned on. The benefit of such circuitry is evident when one considers that at the instance of turn on the lamps' impedance is quite low. The slow start slows down the output current from a rather fast (μs) pulse to a slow (0.1 s) rise. This will result in improved lamp life.

Remote Connector

The signals which are available at J302 allows one to monitor the output of the supply from a remote location via a meter or an A/D converter and a computer. All signals are 0–10 VDC with a 47kΩ series resistor. Two additional signals are available for enhanced control of the supply, and therefore, the light source. These are the reference output (0–5 VDC), and the control input (0–5VDC). An output sample of the light at all or selected wavelengths can be compared to the reference output. The difference between the two may change due to lamp aging. This difference can then be amplified, and sent into the power supply to compensate for this change. The result will be constant light output over time. The Oriel Model 68850 Photofeedback System is an excellent example of such an application.

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VI

CIRCUIT DESCRIPTION

General

Please refer to schematic number 68830–3–1001 when reading this section. The schematic gives a block diagram view of the major components of the power supply. The 68830 was designed in a modular way for reliability and for maintenance, and the schematic reflects this component approach to the power supply design.

The input mains is applied via J304, through the integrated circuit breaker/power switch, and the line voltage selector to T1. T1 steps down the input to a low voltage AC (24 volts nominal) which is then connected to the coil of K1. The AC connection is not complete unless the interlock is made by a jumper or a contact closure.

A complete connection at J301 will energize K1 and allow mains power to be applied to the main power supply module (27–20–008). The power supply module will then begin to operate and convert the AC mains voltage to a line isolated DC current. The power supply module is a state–of–the–art, current mode switching power supply which operates at 40kHz.

The meter board (68805–1210) continuously monitors the output of the power supply via J1. It also provides the required voltage levels for the meter, for the remote inputs, and for the remote outputs via J2 and J302.

DC power is then delivered to the load through the color coded rear panel mounted connectors, J306 (red/positive/+) and J307 (black/negative/-). Either of these connections may be ground referenced, if needed, because these are line isolated outputs.

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Specific Descriptions

Power Module (27–20–008)

This module is not meant to be field serviceable therefore, only a general theory of operation is provided. Please contact your representative if any problems arise.

This module is an off–line two transistor forward converter operating at a frequency of 40kHz. The switching stage operates in current mode for increased reliability and line voltage regulation. The input stage is connected directly to the AC mains, and line voltage selection is done by S301. This is then rectified and filtered to provide the bulk, unregulated DC voltage for the switching stage. An on board, low current transformer steps down, and line isolates the control circuit's power source. An advanced secondary side filter network, and feedback loop serve to maintain a constant DC output current with excellent regulation and control.

Meter Board (68805–1210)

Please refer to schematic number 68805–3–1211 for this circuitry.

J1 pins 7 and 9 provide the AC for this circuit. This is rectified and filtered by CR1, C1 and C3. The raw DC is applied to VR1 and VR2 which then supply the regulated + and - 15 volts for the supervisory circuits.

The output current signal enters the board via J1 pin 6 where it is then amplified by a two stage operational amplifier (U1). The nominal voltage gain is 85. The output of the second stage is present at one of the inputs to U2, and is also scaled by R5 and R6 to provide the current for the meter.

The output voltage signal enters the board via J1 pin 10. A resistive voltage divider consisting of R8 and R11 scale this to a 0–10 volt level which is then present at the other input to U2. Scaling for the meter is done by the R9, R13 combination.

Power is derived by analog multiplier U2. This integrated circuit multiplies the proportional input representation of output current and voltage at pins 1 and 3. The output from U2 at pin 7 is then scaled for the meter to display power.

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The reference voltage from the power module enters the meter board at J1 pin 1. It is then connected to the front panel mounted adjustment potentiometer R201 whose wiper is connected to J3 pin 2. This variable voltage exits the meter board via J1 pin 2, and is connected to power module. As the wiper voltage changes from 0–5 volts, the output of the module changes.

J4 serves as the interface to the meter, the meter select switch, and the preadjust switch. See schematic number 68830–3–1001.

J2 serves as the interface to the rear panel mounted remote socket to provide the signal levels or accept the external signal level for remote monitoring and control of the power supply.

The four, top mounted trimmer potentiometers are used only to calibrate the meter. They have no interaction with the power module. Their function is as follows:

R6	Current display trimmer
R12	Power display trimmer
R13	Voltage display trimmer
R16	Preadjust display trimmer

The RC and transistor network which interrupts the connection at J1 pin 1 and J3 pin 3 form the slow start function which slows down the output current and voltage rise by delaying the control voltage to R201. This delay is continued on through to the control input of the power module.

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SECTION VII – 1
CALIBRATION AND TROUBLESHOOTING

Warning: *The power module (27–20–008) of the model 68830 power supply has no field serviceable parts. Do not attempt to repair the module in the field. If a failure of the module occurs, then contact your representative for service.*

Only qualified service personnel should attempt repair or calibration of the unit. They must exercise extreme caution when working in the unit with power on. Dangerous voltage levels exist within the unit which could harm if proper, conventional electronic troubleshooting techniques are not adhered to.

A thorough understanding of the circuit description and schematic numbers 68830–3–1001, and 68805–3–1211 should be had before attempting any work.

Calibration

The required equipment to calibrate the power the power supply, is an external 300 watt load resistor of less than 3Ω, and external voltage and current meters

With the unit off, remove the top cover, and connect the external ammeter in series with the load resistor. Connect the voltmeter from positive to negative of the output posts at the rear panel. Turn the "ADJUST" knob full counter–clockwise.

Switch the power supply on and adjust the output via the front panel control so that the output current as viewed on the external ammeter is an even value. Trim R6 so that the front panel meter display agrees with the external ammeter.

Without changing the control knob setting press the "PREADJUST" switch. Trim R16 so that the front panel meter displays the output current setting. There will be a slight decrease in the output current when this switch is pressed. Therefore, adjust R16 to the output current value that was measured with the external ammeter prior to pressing this switch.

Rotate the front panel control knob so that the output voltage is an even value. Trim R13 so that the front panel meter agrees with the external voltmeter.

Adjust the output with the front panel control until the product of the external meters is an even value. Trim R12 so that the front panel meter agrees with this value. Calibration is now complete. Switch the power supply off, and replace the cover.

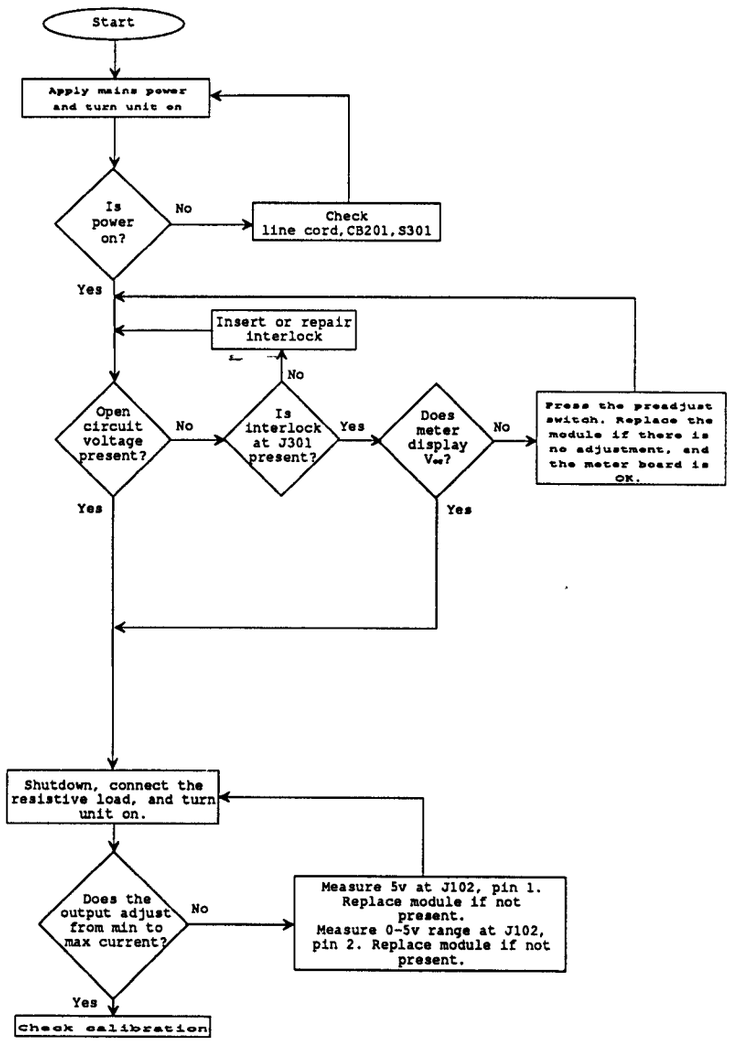
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Troubleshooting

The possibility of a fault occurring during its operational life is likely with any electronic equipment. We have strived to make this the most reliable power supply available. A competent service person should perform any maintenance if a problem does occur. It is strongly recommended that field repair be limited to the repair or replacement of all components which are readily available. *No attempt should be made to repair the power supply module to the component level.* Simply replace and return the defective module to Oriel. Board level replacements are easily implemented in these units.

The flowchart on the next page will help in narrowing down the possible areas of a problem. Please do not overlook the obvious reasons for improper operation such as; incorrect cable hookup or control settings, obviously damaged components and loose or broken connections.

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MODEL 68830 POWER SUPPLY
TROUBLESHOOTING FLOWCHART

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VIII

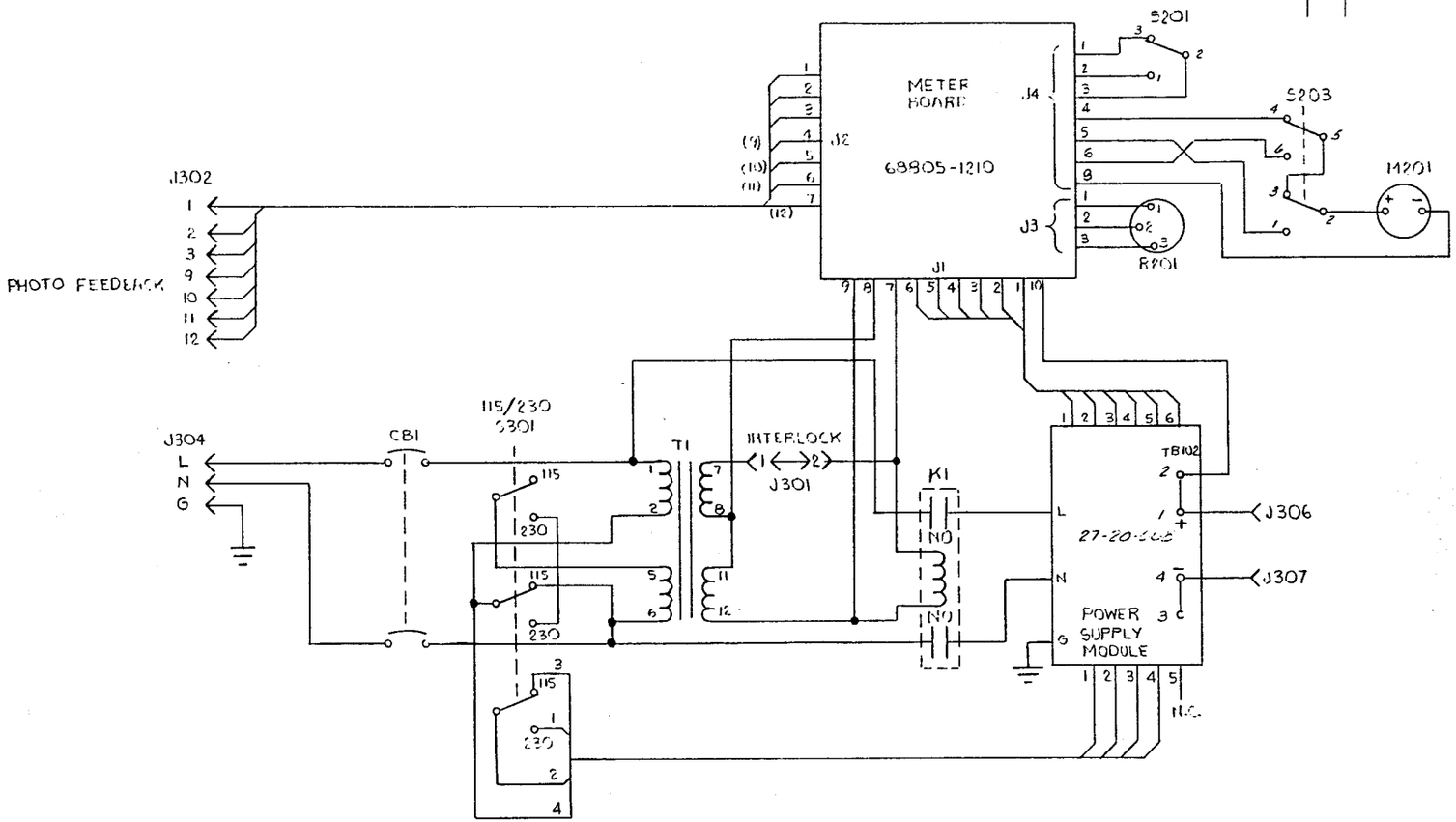
DRAWINGS

The following drawing/schematics are included with this manual. Parts lists are provided upon request.

68830–3–1001	System Interconnect Diagram
68805–3–1211	Meter Board Schematic

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REV	DESCRIPTION	DATE	BY
A	ERN 1497 PRODUCTION RELEASE	2-21-89	JT
B	ERR 11901 REMOVED CONN. FOR J303	3-13-85	LW
C	DELETED J302-7 & -8. ERR # 12798	10/93	WBC



MATERIAL	DATE DRAWN 7-13-88	ORIEL CORPORATION STRATFORD, CONNECTICUT
FINISH	DRAWN BY MULLEN	
DO NOT SCALE DRAWING	CHECKED	TITLE SYSTEM POWER DISTRIB & INTERCONNECT DIAGRAM CONSTANT CURRENT SOURCE
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 .02 X 45° ANY 2 DIAS CONCENTRIC WITHIN .005 TIR		DRAWING NO 68830-3-1001
	SCALE	

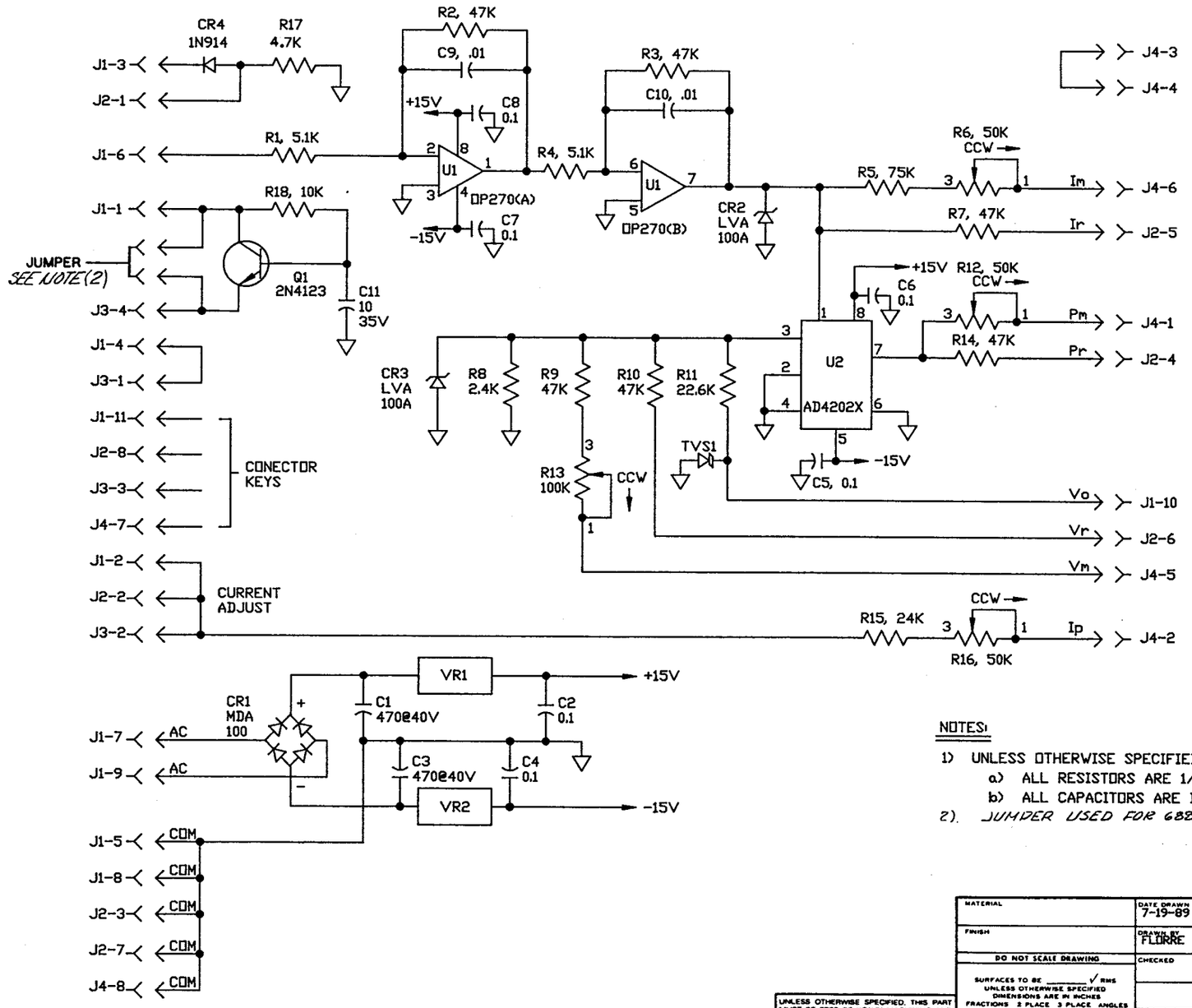
UNLESS OTHERWISE SPECIFIED THIS PART MUST BE FREE OF HEAVY MACHINING AND EXTRUSION MARKS GOUGES NICKS AND DENTS BREAK ALL SHARP CORNERS AND REMOVE ALL BURRS PARTS MUST BE CLEANED FREE OF CHIPS GRIT GREASE OIL ETC

Design Products Co. Inc. Chatsworth 91311

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REV	DESCRIPTION	DATE	BY
B	ERR 11497 ADDED C11, Q1, R18, R19, & CR4 R17 WAS 10K, 1/2 WATT, 5%.	7-10-89	RF
C	ERR 12102 DELETED R19, ADDED J5, R9 WAS 75K, R13 WAS 50K.	6-12-90	RF



NOTES:

1) UNLESS OTHERWISE SPECIFIED:
   a) ALL RESISTORS ARE 1/4W, 5%
   b) ALL CAPACITORS ARE IN uF.
2) JUMPER USED FOR 68805, 68806 ONLY

MATERIAL	DATE DRAWN 7-19-89	ORIEL CORPORATION STRATFORD, CONNECTICUT
FINISH	DRAWN BY FLURRE	
DO NOT SCALE DRAWING	CHECKED	TITLE: SCHEMATIC, METER P.W.B. UNIVERSAL POWER SUPPLY
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 .02X45° ANY 2 DIAS CONCENTRIC WITHIN .005 TIR	SCALE	DRAWING NO 68805-3-1211

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

Design Products Co. Cheyenne WY82009

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 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.

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. If goods are not returned to Oriel Instruments, and user chooses to have repairs made at their premises, Oriel Instruments shall provide labor for field adjustment, repair and/or replacement at prevailing rates for field service, on a portal-to-portal basis.

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. This provision shall not apply to any accessory, equipment or part which does not affect the safe operation of the device.

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 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 while in their care, custody and control. If damage occurs, unrelated to the proper and warranted use and performance of the goods, 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 repairs not covered by warranty, with the cost of the repair, before starting the work.

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.

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