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PS-450DC
POWER SUPPLY

OPERATION MANUAL

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UM0005 Rev J

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WARNING!

The PS-450DC Power Supply produces lethal voltages. Ensure that input power is disconnected and storage capacitors have been discharged before beginning any inspection or internal adjustment.

WARNUNG!

Das Netzteil PS-450DC erzeugt lebensgefährliche Spannungen. Es muss deshalb darauf geachtet werden, dass der ankommende Strom ausgeschaltet ist und die Ladekondensatoren entladen sind, bevor Kontrollen oder Regelungen am Gerät unternommen werden!

ATTENTION!

L'alimentation PS-450DC fournit des tensions dangereuses. Veuillez vérifier que la prise de courant est déconnectée et les condensateurs d'accumulation sont déchargés avant d'entreprendre des inspections ou des réglages sur l'appareil.



WARNING!

The output voltage of the PS-450DC MUST be limited to match the specifications of those components to which it is connected. Exposing any system component to voltage (or any other operating condition) that exceeds its rating can result in damage to the unit and personal injury.



WARNUNG!

Die Ausgangsspannung des Netzteils PS-450DC muss der Leistung aller damit verbundenen Komponenten angepasst werden. Systemelemente Spannungen (oder anderen Betriebsbedingungen) auszusetzen, die die Leistungswerte jener Komponenten übertreffen, ist gefährlich und kann zu Schäden und Verletzungen führen.

ATTENTION!

Il faut que la tension fournie par l'alimentation PS-450DC soit limitée aux caractéristiques des composants auxquels il sera mis en contact. En exposant un composant quelconque à une tension (ou à d'autres conditions de fonctionnement), qui en dépasse la limite on pourrait endommager l'appareil ou provoquer des blessures.



WARNING!

The PS-450DC Power Supply is capable of producing 60 watts of output power. Heatsinking of metal-can flashlamps and Lite-Pacs is required when these devices are operated above 25 watts.

WARNUNG!

Das Netzteil PS-450DC erzeugt bis zu 60 Watt Ausgang. Bei Leistungen höher als 25 Watt müssen Dosenlampe sowie Triggermodul, mittels eines Kühlblechs, abgekühlt werden.

ATTENTION!

L'alimentation PS-450DC fournit jusqu' à 60 watt de puissance débitée. Quand une lampe à boite en métal et un déclenchement fonctionnent au dessus de 25 watt, il faut les refroidir au moyen d'une source froide.

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1.0 INTRODUCTION

The PS-450DC Power Supply is designed for high-energy capacitor discharge service with linear xenon-filled flashtubes or short-arc flashlamps with companion Lite-Pacs. It can be used to power clinical and analytical instrumentation, machine vision strobes and other strobe systems.

The PS-450DC unit operates from a 24 VDC input at 4 amps. It is available enclosed in a metal chassis, as an unenclosed printed circuit board (PC-450DC), or in several Machine Vision Systems, such as the MVS-2600 and MVS-3000 series. The enclosed version is dimensioned below.

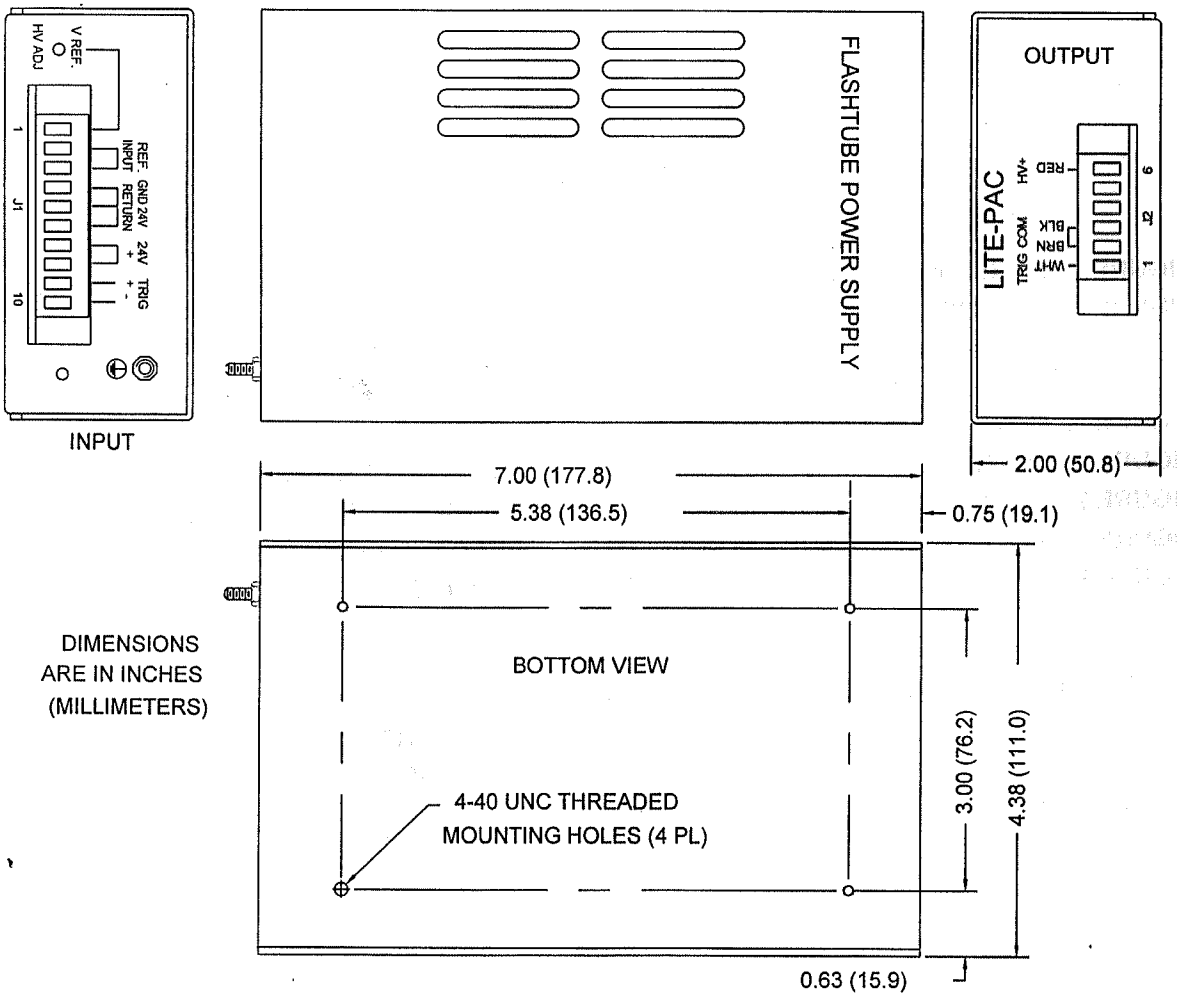


Figure 1. PS-450DC Outline and Mounting Dimensions

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2.0 SPECIFICATIONS

Table 1. Electrical Input Specifications

Voltage[1]	15-28VDC
Current	4A average at 24V
Trigger	TTL compatible, optically isolated[2] 5µS pulse width minimum on time, duty cycle 50% or less.
Trigger current	20 to 40mA peak
Reference voltage	2 to 10VDC

[1]Inductor and filter capacitor at + input.
[2]Optical Isolator: 4N26 or 4N36 with 150Ω series resistor.

Table 2. Electrical Ouput (discharge) Specifications

Average power	60W maximum
Low range voltage[3]	100 to 500V maximum
High range voltage[3]	200 to 1KV maximum
Line regulation	±1%
Peak to peak ripple voltage	0.05% @ 600V, 1µF
Internal discharge capacitor	0.05µF
Recharge delay (typical)	150µS
Internal output bleeder	1.35MΩ
Charge rate (minimum)	75J/S @ 1KV, 24V

[3]Output V to Reference V ratio: 50:1±3% Lo Range; 100:1±3% Hi Range.
Range can be changed by internal jumper, S1. Units shipped in LO Range.

Table 3. Electrical Output (trigger) Specifications

Trigger capacitor	0.47µF	0.22µF
Trigger capacitor voltage	175V ±15V	170V ±10V
Maximum pulse rate	1KHz	1KHz

Table 4. Environmental Specifications

Operating temperature	-10°F to +110°F (-23°C to +43°C)
Storage temperature	-40°F to +194°F (-40°C to +90°C)

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3.0 INSTALLATION

3.1 UNPACKING

If the condition of the outer packaging suggests mishandling has occurred, examine the PS-450DC unit for any signs of breakage during shipment. If there are any obvious signs of damage, contact the carrier immediately and do not proceed with the installation.

It is suggested that the packaging material be retained and stored in the event that the unit has to be reshipped.

3.2 MOUNTING

Use the four threaded holes (4-40 UNC) in the base of the PS-450DC enclosure to mount the unit in any position (see Figure 1). Mounting hardware is user-supplied.

The PC-450DC Printed Circuit Board has four holes for mounting (see Figure 2).

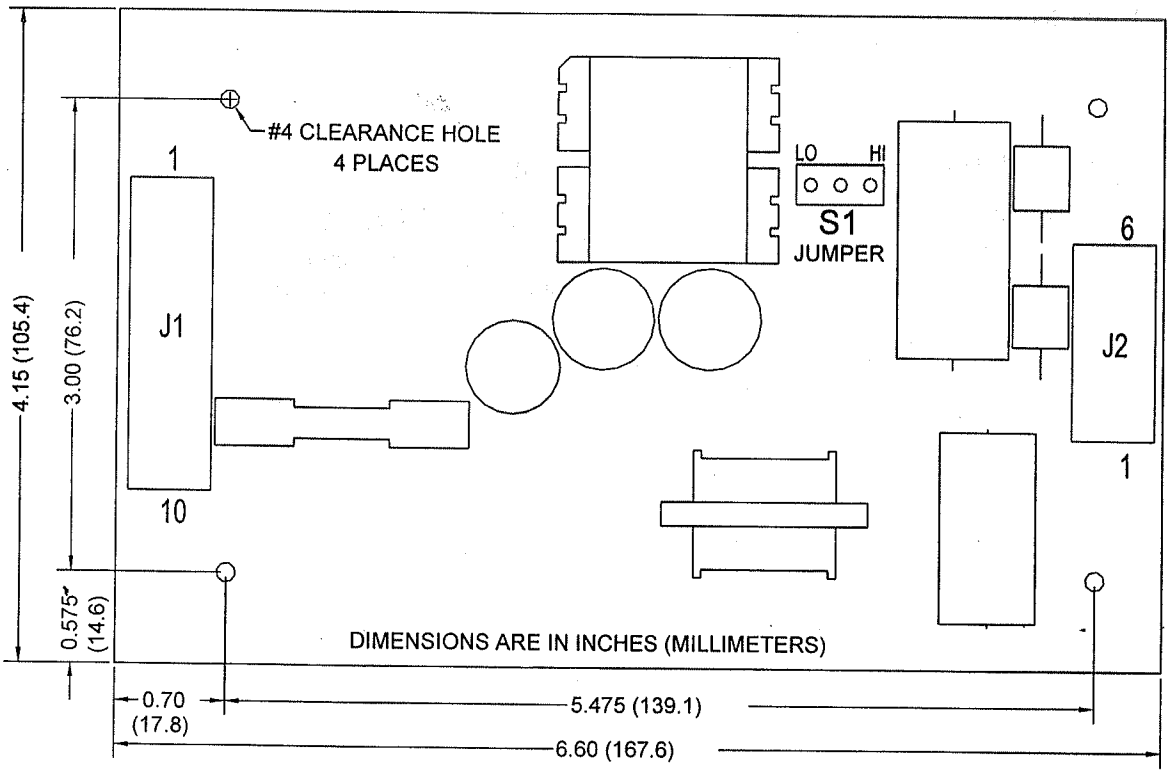


Figure 2. PC-450DC Outline and Mounting Dimensions

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4.0 OPERATING CONDITIONS

4.1 POWER CONVERSION METHOD

The PS-450DC Power Supply uses a high frequency, inductive storage, energy release (flyback) charging system. Output voltage level control is maintained by sensing through a HV divider to a reference, difference amplifier. The difference amplifier controls the number of energy cycles released to the storage capacitor in accordance with the variable reference voltage (V_{ref}) applied to the input.

The LOW range of the output HV is from 100 to 500VDC, corresponding to 50 volts output per volt of reference input (V_{ref}). The HIGH range is from 200 to 1000VDC, or 100 volts output per volt of reference input (V_{ref}).

The "high-low" output voltage range jumper (**S1**) is included on the PC board (see Figure 2) to maximize throughput power at voltages below 500V. The PS-450DC is shipped with the jumper in the "LO" position, providing for an output voltage range between 200 and 500V.

4.2 ENERGY RELEATIONSHIPS

Before operating the supply, determine the external capacitor value (C in microfarads), the maximum output voltage (V_m in kilovolts), and the maximum energy (J in joules) required for the application using the formula $J = \frac{1}{2}CV^2$.

(Note: A fixed 0.05µF capacitor is built into the supply and must be included in all calculations.)

Example: C = 4µF
(including the 0.05µF internal cap)

V_m = 500V
J = 0.5 joules

Referring to the charge rate curves shown in Figure 3, the power supply charges to 500V (high range) at a rate of 57J/sec for 24V input. The time to charge to 0.5 joules is:

0.5J ÷ 57J/sec = 8.8msec

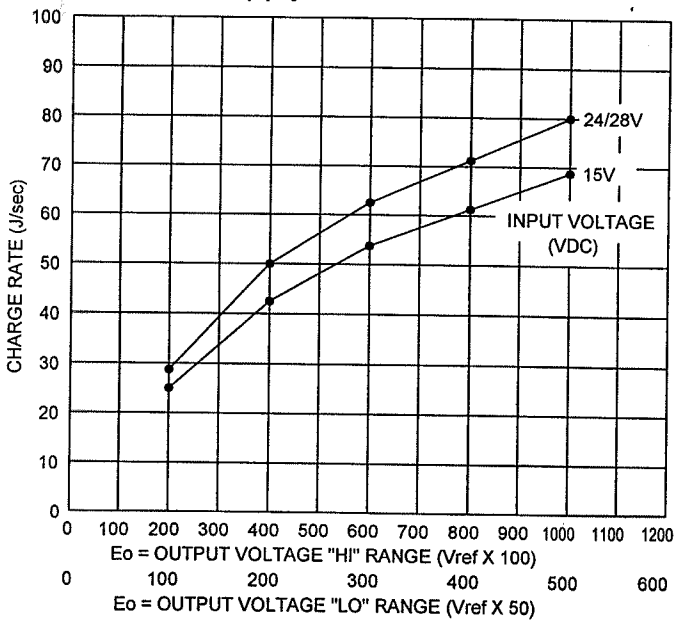


Figure 3. Charge Rate vs. Output Voltage

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The minimum time between flashes is 8.8msec for a full 0.5 joule discharge. Continuous pulse discharge operation in this mode delivers:

watts = joules/sec = 0.5 ÷ 0.0088 or 57 watts

Operation is therefore within the maximum 60W rating of the PS-450DC unit.

With the range jumper in the "LO" position, the PS-450DC charges at 80J/sec for 24V input (see Figure 4). Time required to reach 0.5 joule is 0.5/80 or 6.25msec. Continuous operation in this mode delivers 80J/sec or 80 watts.

Long-term (1 minute or more) average power must be limited to 60 watts. The average discharge rate for supply operation over 1 minute must be limited to:

J (energy per discharge) x f (flash rate) = 60;
f = 60/0.5 or 120 flashes per second

The flashtube may be fired any time after t = 6.25msec (see Figure 4).

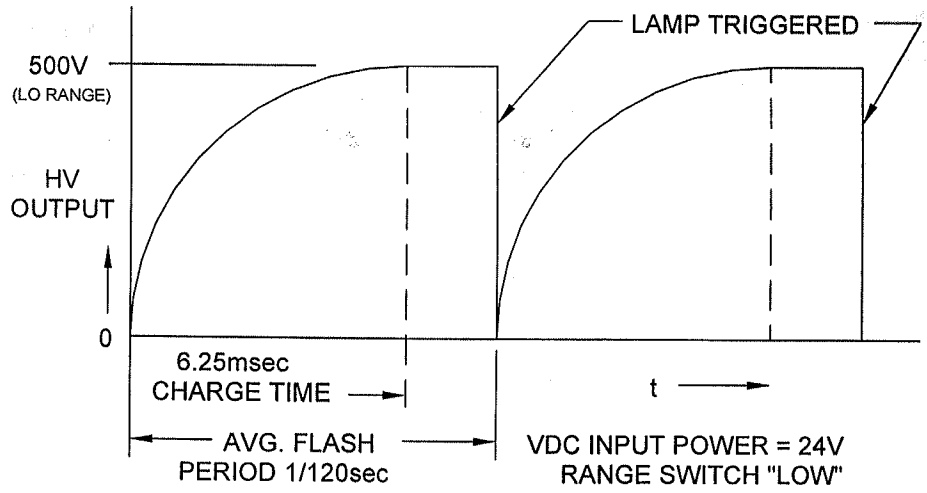


Figure 4. Output Voltage vs. Time

WARNING!

The PS-450DC Power Supply produces lethal voltages. Ensure that input power is disconnected and storage capacitors have been discharged before beginning any inspection or internal adjustment.

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5.0 OPERATION

WARNING!

The ouput voltage of the PS-450DC MUST be limited to match the specifications of those componenets to which it is connected. Exposing any system component to voltage (or any other operating condition) that exceeds its rating can result in damage to the unit and personal injury.

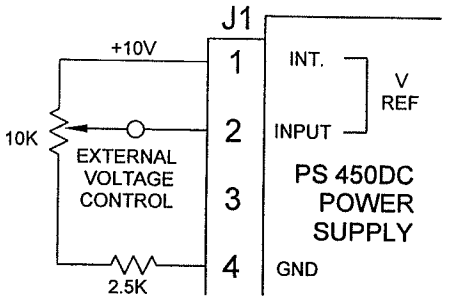
5.1 OUTPUT VOLTAGE ADJUSTMENT MODE SELECTION

The output voltage level is controlled by a reference voltage (V_{ref}) which may be generated internally or applied externally.

For *internal* adjustment of the output voltage, pins 1 and 2 of the input connector J1 must be jumpered (see Figures 7 & 8). The output voltage level can then be set by adjusting the potentiometer RV1 on the printed circuit board.

The output voltage level can be controlled by an *external* potentiometer connected as shown in Figure 5.
Output voltage adjustment may also be accomplished by connecting the output of any source such as a digital-to-analog converter (<5KΩ impedance) directly to pin J1-2 and ground.

Whenever external voltage adjustment is used, if the V_{ref} input is adjusted to zero, the output voltage will drop to less than 200V (high range) or 100V (low range).



NOTE: ROTATE INTERNAL HV REFERENCE ADJUSTMENT CONTROL FULLY CLOCKWISE FOR FULL OUTPUT VOLTAGE.

Figure 5. Remote Voltage Control

5.2 INTERCONNECTIONS

Once operating conditions have been determined, make input and output connections according to Figure 7a, Figure 7b or Figure 8. Keep lead lengths as short as possible.

Connectors J1 and J2 are Wago Type 238 modular terminal strips, illustrated in Figure 6.

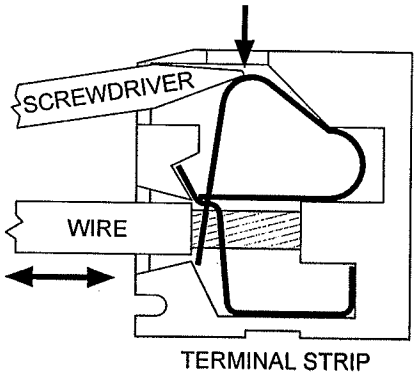


Figure 6. Terminal Strip Cross Section

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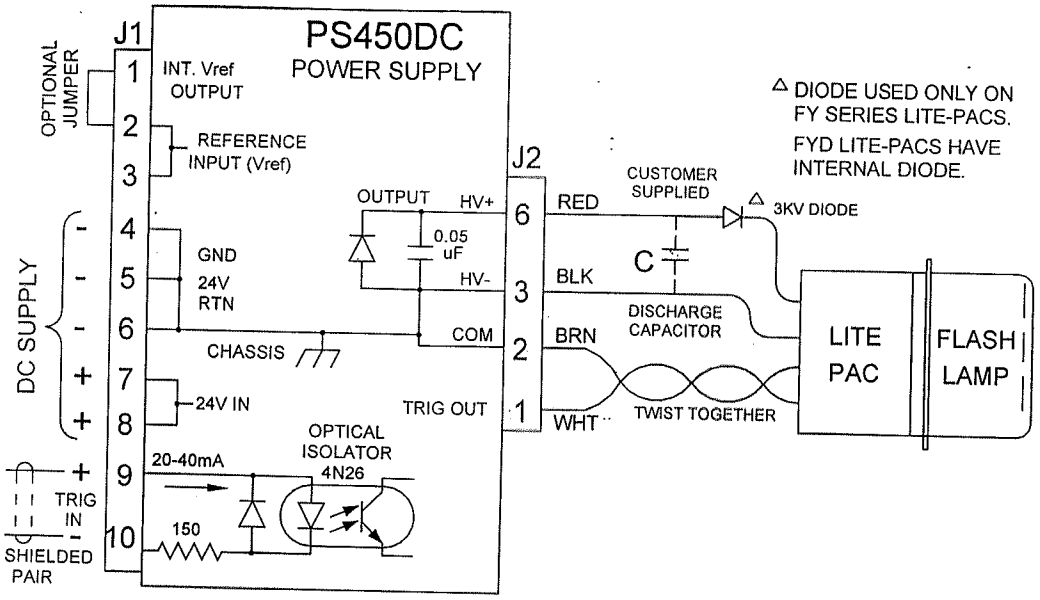


Figure 7. Typical Connections (Standard Lite-Pac Wiring)

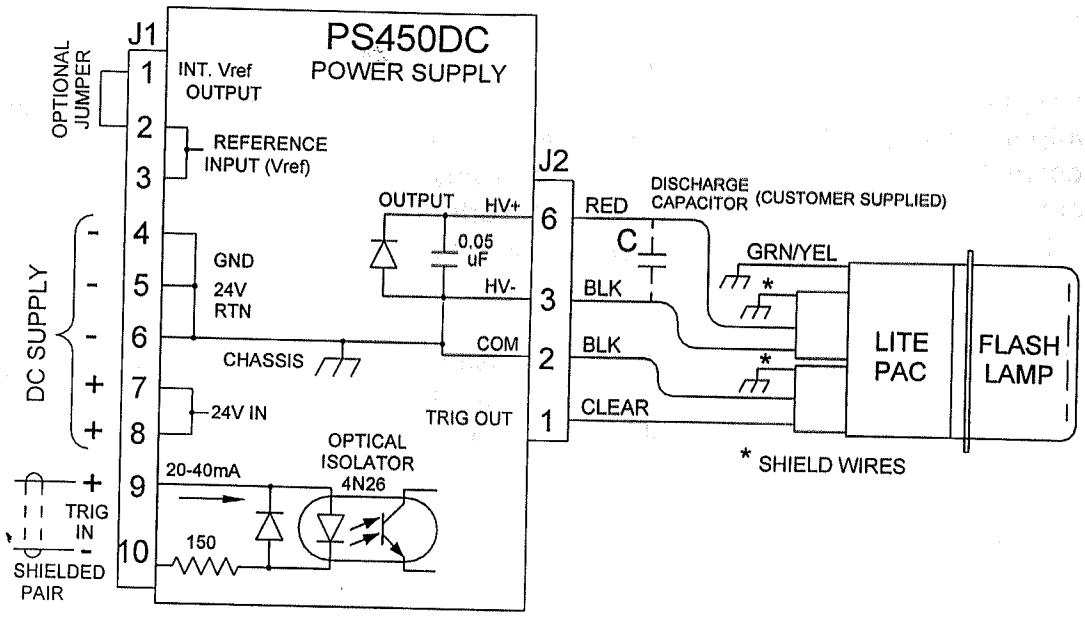


Figure 8. Typical Connections (Shielded Lite-Pac Wiring)

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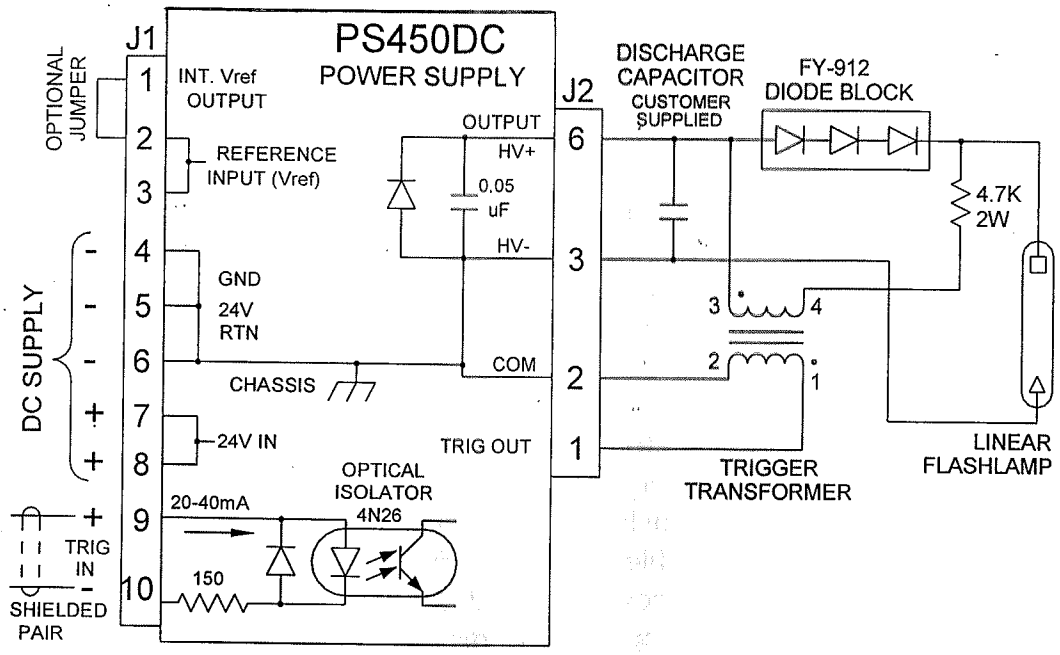


Figure 9. Typical Connections for Linear Lamps (Pseudo-Series Triggering)

5.3 HV BLEEDER

The unit contains about 1.35 megohms of bleed resistance effectively across the output storage capacitor. A resistance of no less than 500KΩ may be added to any external capacitor to speed bleed-down time when DC input is removed, or when programming V_{ref} from a higher to a lower voltage setting.

5.4 OPERATING EXAMPLES

When the power supply is used with an FYD series Lite-Pac, it should not be operated above 25 watts. The Lite-Pac trigger voltage protection diode is packaged internally.

The FY series Lite-Pac is not equipped with an internal diode and must be used in conjunction with an FY912 Diode Pac. This combination allows the PS-450DC to be used to its maximum power of 60 watts.

WARNING!
The PS-450DC Power Supply is capable of producing 60 watts of output power. Heatsinking of metal-can flashlamps and Lite-Pacs is required when these devices are operated above 25 watts.

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6.0 MAINTENANCE

6.1 REPAIRS

The PS-450DC Power Supply is, generally speaking, a trouble-free unit. No routine maintenance or repair is required.

In the event that the unit fails or does not function properly, it is strongly suggested that no attempt be made to troubleshoot. Field repairs or customer modifications are not authorized, and, if attempted, will void the warranty. Repairs must be made only by factory-trained personnel.

6.2 REPACKING AND STORAGE

If the PS-450DC unit is to be stored for a prolonged period, shipped to another location, or returned to the factory for repair, it should be repacked in the original packaging material. If the packaging material has been discarded, the unit should be packaged in a suitable container with sufficient protective material to ensure that the unit cannot move within the package and is protected from damage that could occur from improper handling.

If the unit is to be stored for a prolonged period, the storage area should be dry, at a temperature of -40°F to +194°F (-40°C to +90°C).

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