

# OPERATOR'S MANUAL

## FPD 100 WATT POWER SUPPLIES

Flat Pack Single Output DC to DC Converter  
100 Watts Output  
90 to 185 Vdc Input

KEPCO INC.  
An ISO 9001 Company.

### MODEL FPD 100W-150V POWER SUPPLY

ORDER NO.

REV. NO.

#### IMPORTANT NOTES:

- 1) This manual is valid for the following Model and associated serial numbers:

MODEL	SERIAL NO.	REV. NO.
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- 2) A Change Page may be included at the end of the manual. All applicable changes and revision number changes are documented with reference to the equipment serial numbers. Before using this Operator's Manual, check your equipment serial number to identify your model. If in doubt, contact your nearest Kepco Representative, or the Kepco Documentation Office in New York, (718) 461-7000, requesting the correct revision for your particular model and serial number.
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**FLAT PACK  
Single Output  
DC to DC Converters**

**I INTRODUCTION:**

**SCOPE OF MANUAL:** This instruction manual contains information for the installation and operation of the Kepco FPD 100W-150 DC to DC Converter Series of switching power supplies. For further operating and service information for the FPD 100W-150 DC to DC Converter Series contact your Kepco Representative directly, or write to Kepco, Inc., 131-38 Sanford Avenue, Flushing, New York 11352 U.S.A.

**DESCRIPTION:** The Kepco FPD 100W-150 DC to DC Converter Series consists of four switching power supplies, having a nominal 110 to 165 Vdc input and different DC output voltages, rated as listed in Section II. FPD 100W-150 Converter switching power supplies have similar electrical specifications, except for the output ratings. They are low-dissipative stabilizers, using pulse-width modulation to control the output. The units feature input/output isolation and remote ON/OFF. Remote ON/OFF is accomplished by an isolated TTL signal that may use either mechanical or solid state closure for turn-off. All models are guaranteed for one year when operated within the specifications given herein.

**II MODELS:**

The following specifications apply to the power supply models listed below:

MODEL	INPUT	OUTPUT
FPD 5-20-150	110-165 Vdc	5 Vdc 20A
FPD 12-8.3-150	110-165 Vdc	12 Vdc 8.3A
FPD 15-6.6-150	110-165 Vdc	15 Vdc 6.6A
FPD 24-4.2-150	110-165 Vdc	24 Vdc 4.2A

**III SPECIFICATIONS:**

Nominal Input Voltage:	110-165 Vdc
Input Voltage Range:	90-185 Vdc
Input Current:	1.5A/1.0A Maximum at 110 /165 Vdc Input
Brownout Voltage:	88 Vdc
Efficiency:	80 percent Typical
Switching Frequency:	500 kHz Typical
Circuit Type:	Forward Converter
Soft Start Circuit:	None
Input Fuse:	None <sup>(1)</sup>
Leakage Current:	1000pF Y Capacitors are connected between (+) and (-) input terminals and G terminal (See Figure 2)

<sup>(1)</sup> Recommended external fuse is 2.5 to 3.0A. Connect fuse to (+) input line (See Figure 2)

#### IV OUTPUT SPECIFICATIONS:

MODEL	FPD 5-20-150	FPD 12-8.3-150	FPD 15-6.6-150	FPD 24-4.2-150
Output Voltage Nominal	5V	12V	15V	24V
Output Current Nominal	20A	8.3A	6.6A	4.2A
Output Power Maximum	100W	99.6W	99W	100.8W
Voltage Adjustment Range (Fig. 3)	4.0~ 5.5V	10.8~13.2V	13.5~16.5	21.6~26.4
Ripple, Maximum 0-50 Degrees C 10-100 % Load	150mV p-p	200mV p-p	200mV p-p	200mV p-p
Noise, DC to 50 MHz, Maximum 0-50 Degrees C 10-100% Load	250mV p-p	300mV p-p	300mV p-p	400mV p-p
Overcurrent Setting Square Wave Characteristic	20.6~ 27.0A	8.5~ 11.2A	6.8~8.9A	4.3~5.7A
Overvoltage Setting Shut Down Characteristic	5.5~ 6.9V	13.7~15.7V	17.0~19.0V	27.0~30.5

Source Effect	0.5% Typical — 2% Maximum (Min - Max Input)
Load Effect	1% Typical — 2% Maximum (10-100% Load)
Temperature Effect	0.5% Typical — 2% Maximum (0-71 Degrees C)
Combined Effect	±1.5% Typical — ±3% Maximum (Source, Load, Temperature)
Time Effect	0.1% Typical — 0.5% Maximum (0.5~8 Hours at 25 Degrees C)
Recovery Characteristics 50 to 100% Load Change	Less Than ± 4 Percent Excursion . Recovery to within 1 percent in less than 1ms (tr, tf of load change ≥ 50 μs at 110-165V Input (See Figure 3)
Remote Sensing	Remote Sensing compensates for voltage drops of up to 0.4V per wire (0.25 Volts for the FPD 5-20-150 Model)
Remote ON/OFF	Primary Side of Circuit Between the RC and (-) Input Terminals: Open or 2.5 -5 Volt: Output ON 0 to 0.4 Volts: Output OFF

#### V GENERAL SPECIFICATIONS

SPECIFICATIONS	CONDITIONS	
Temperature	Operating 0~71 Degrees C Storage - 40 ~ 75 Degrees C	See Figures 5A and 5B
Humidity	Operating and Storage: 5 ~ 95 percent RH	Wet bulb temperature < 35 Degrees C - Non Condensing
Vibration	5 ~10Hz — 10mm Amplitude 10 ~55Hz — 2G Acceleration	Non-Operating 1 Hour on each axis (x,y and z)
Shock	20 G 11± 5 ms Pulse Duration	Non-Operating, 1/2 Sine Pulse - 3 Shocks each axis (xx', yy' and zz')
Dielectric Strength	Input-Output: 2.0 KVdc 1 minute Input-Ground: 2.0 KVdc 1 minute	at 25 Degrees C 65 percent RH
Isolation Resistance	Output-Ground: >100M ohm, 500 Vdc	
Dimensions	5.12 in. (130 mm) x 2.28 in. (58 mm) x 0.52 in. (13.2 mm)	See Mechanical Outline Drawing, Figure 1
Weight	4.23 oz. (120 grams) Maximum	
Cover Material	Plastic (UL94V-O) Resin	
Safety	Designed to meet UL478 and CSA E.B. No. 1402B Level 1	

## VI REMOTE SENSING

Two terminals are provided for remote error sensing (see Figure 4). Remote error sensing can compensate for load wire voltage drops of up to 0.40V per wire (0.25 V for the FPD 5-20-150). The DC to DC converter will not operate if there are no connections between the Sense and Output terminals either at the load or at the DC to DC converter output terminals.

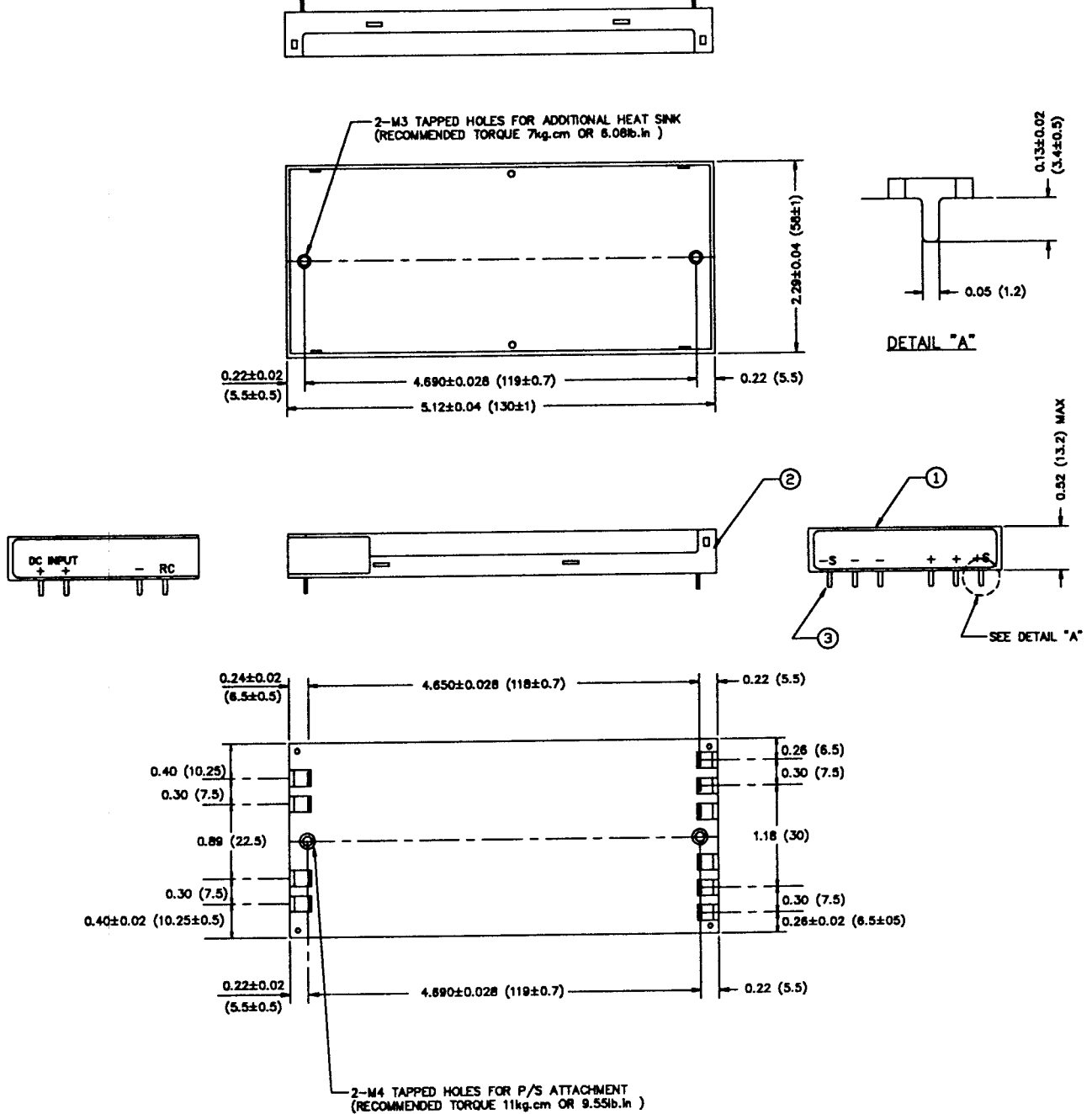
## VII COOLING

The use of a Heat Sink, Kepco Model FIN 100, improves the performance of the FPD 100W-150 DC to DC converter (see Figure 6 for horizontal mounting of the DC to DC converter). The unit can also be mounted vertically as long as the direction of the air flow is as shown.

The Output Power Ratings graph of the FPD 100W-150 (see Figure 5A) is based on two conditions:

1. The use of a Heat Sink (with air flow of 1.7 m/sec (5.58 f/sec)).
2. The temperature of the FPD 100W-150 case surface must comply with the specifications shown in Figure 5B.

For example, at 50°C (ambient temperature) the power rating of the FPD unit is 100%, only when the case temperature is maintained at 70°C, or less. Similarly, at 60°C (ambient temperature) the power rating of the FPD unit is derated to 65%, only when the case temperature is maintained at 77°C, or less. At 71°C (ambient temperature) the power rating of the FPD unit is derated to 30%, only when the case temperature is maintained at 85°C, or less.

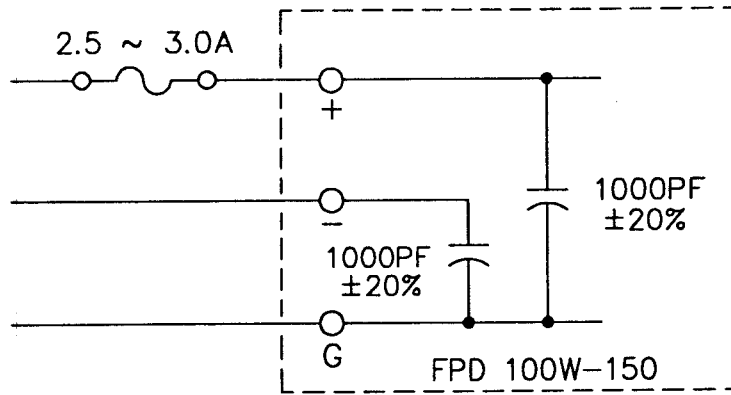


NO.	ITEM	QTY.	MATERIAL DESCRIPTION
3	TERMINAL	10	COPPER ALLOY, 0.01(0.3) THICK, SOLDER PLATED
2	COVER	1	HEAT-RESISTANT RESIN
1	HEAT SINK	1	ALUMINUM

NOTES:

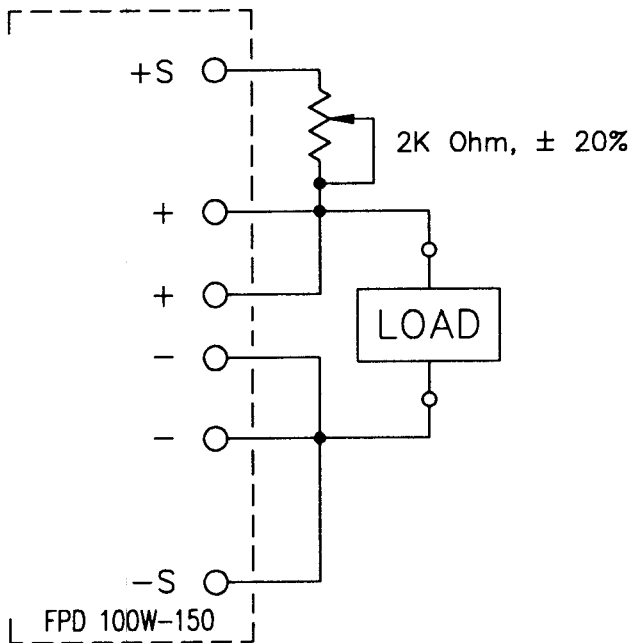
1. DIMENSIONS IN PARENTHESES ARE IN MILLIMETERS, ALL OTHERS ARE IN INCHES.
2. MAXIMUM PENETRATION FOR SCREWS FOR M3 AND M4 MOUNTING HOLES NOT TO BE MORE THAN 0.24in (6mm) FROM CASE SURFACE.
3. ±0.01in. (±0.3mm) TOLERANCE UNLESS OTHERWISE SPECIFIED.
4. KEPCO SUPPLIES THE FOLLOWING HARDWARE FOR FPD METRIC INSERTS:  
TWO METRIC M3 SCREWS WITH CAPTIVE  
FLAT AND LOCK WASHERS P/N 501-0062  
TWO METRIC M4 SCREWS WITH CAPTIVE  
FLAT AND LOCK WASHERS P/N 501-0035  
TWO NYLON WASHERS (FOR INSULATION) P/N 103-0144.

FIGURE 1 MECHANICAL OUTLINE DRAWING OF THE FPD 100W-150 DC TO DC CONVERTER



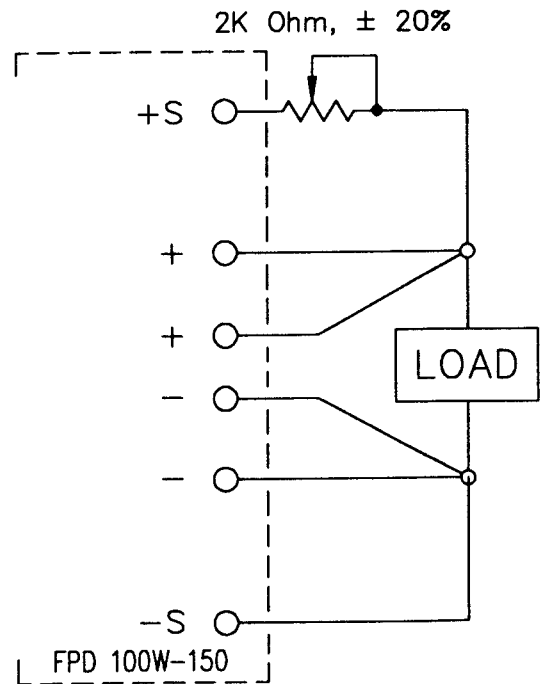
**FIGURE 2 RECOMMENDED EXTERNAL FUSE 2.5 TO 3.0A CONNECTED TO THE (+) INPUT LINE OF THE FPD 100W-150 DC TO DC CONVERTER**

**ADJUSTABLE CIRCUIT**



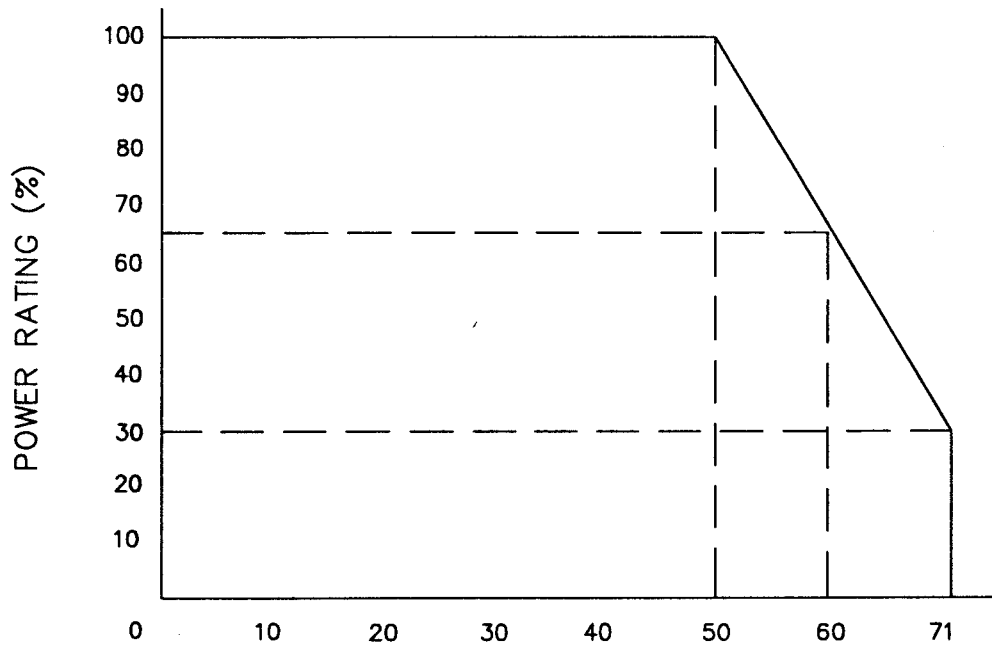
**FIGURE 3 THE FOLLOWING CIRCUIT, WITH THE ADDITION OF A TRIMMER RESISTOR, CAN BE USED TO PERMIT CONTROL OF THE OUTPUT VOLTAGE WITHIN PUBLISHED SPECIFICATIONS**

**REMOTE SENSING CIRCUIT**



**FIGURE 4 FPD 100W-150 DC TO DC CONVERTER WITH REMOTE SENSING**

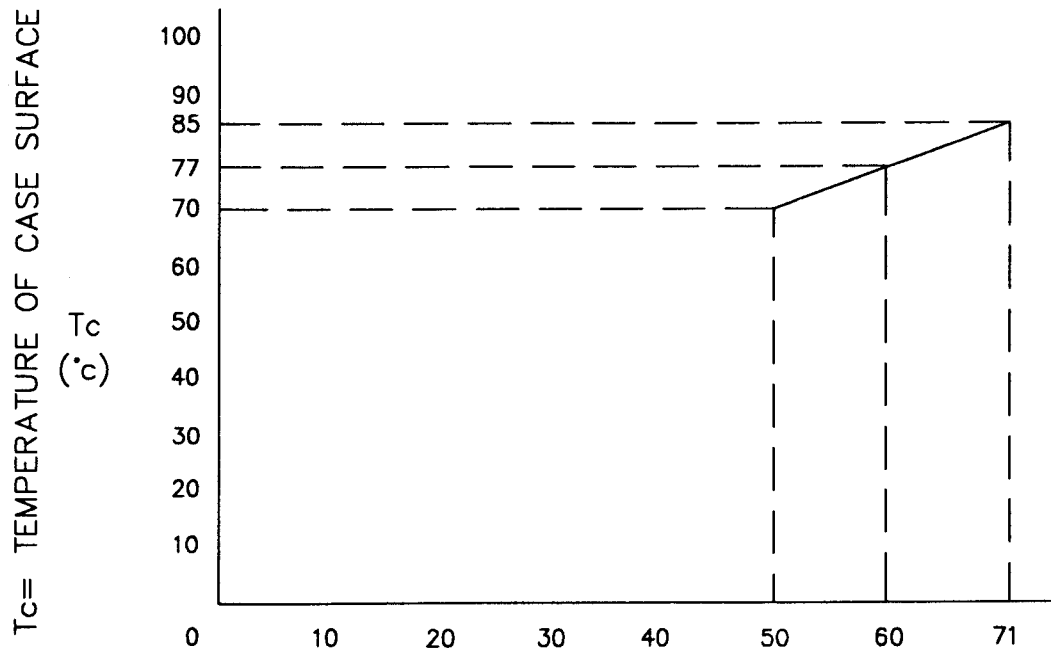
# OUTPUT POWER RATING



(5A) AMBIENT TEMPERATURE (DEGREES C)

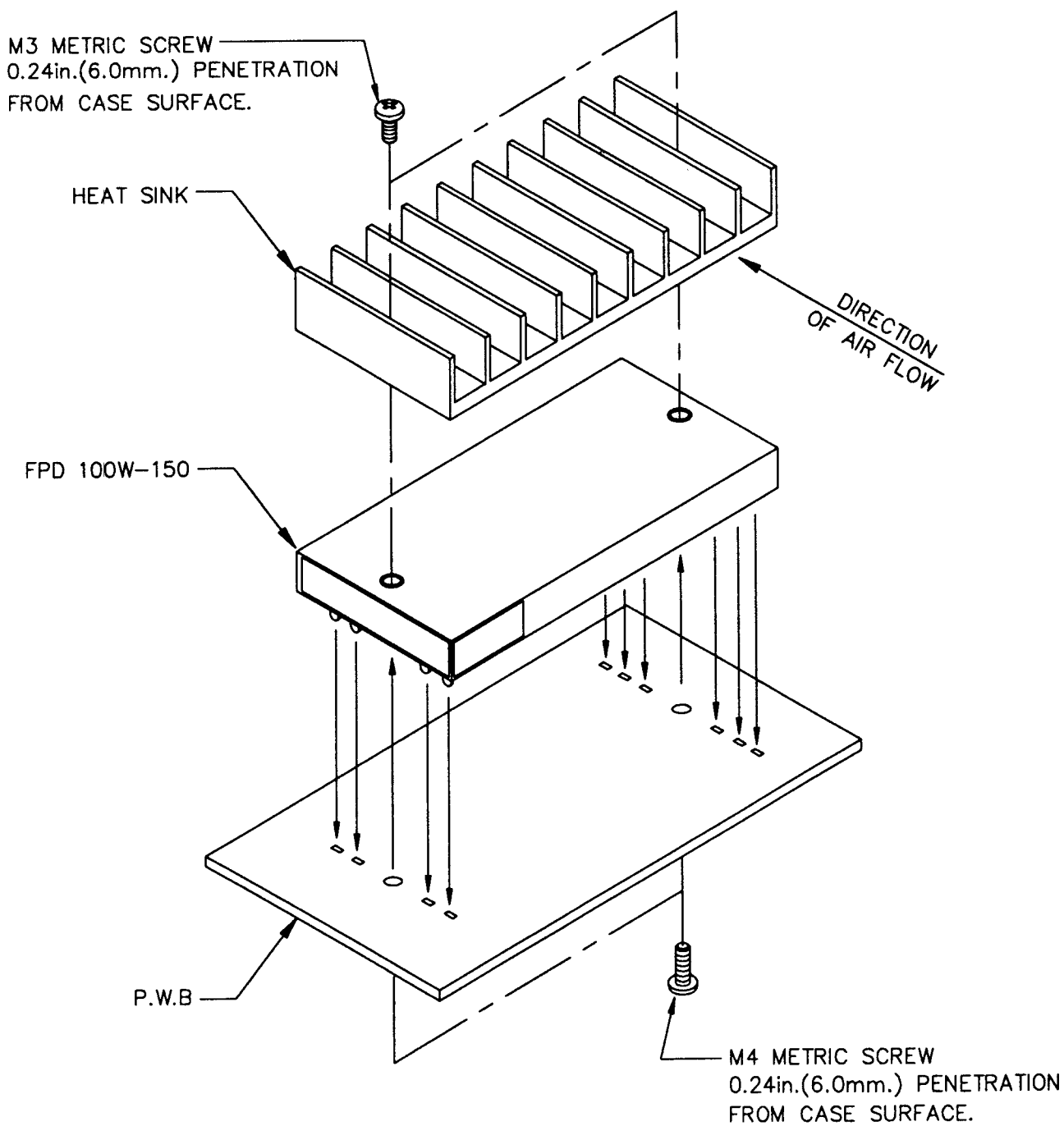
**FIGURE 5A PERCENT OUTPUT POWER RATING VERSUS AMBIENT TEMPERATURE (DEGREES C) FOR THE FPD 100W-150 DC TO DC CONVERTER (SEE CONDITIONS 1 AND 2)**

**CONDITION 1: With a 5.12 (130) X 2.26 (57.5) X 0.79 (20) HEAT SINK ON THE DC TO DC CONVERTER AND AIR FLOW OVER 1.7m/sec (5.58 f/sec)**



(5B) AMBIENT TEMPERATURE (DEGREES C)

**CONDITION 2: FIGURE 5B FOR FIGURE 5A TO BE VALID, THE TEMPERATURE OF THE DC TO DC CONVERTER CASE SURFACE-T<sub>c</sub> MUST BE LESS THAN THE VALUES INDICATED IN FIGURE 5B.**



**FIGURE 6 HEAT SINK FOR HORIZONTAL OR VERTICAL MOUNTING OF THE FPD 100W-150 DC TO DC CONVERTER**



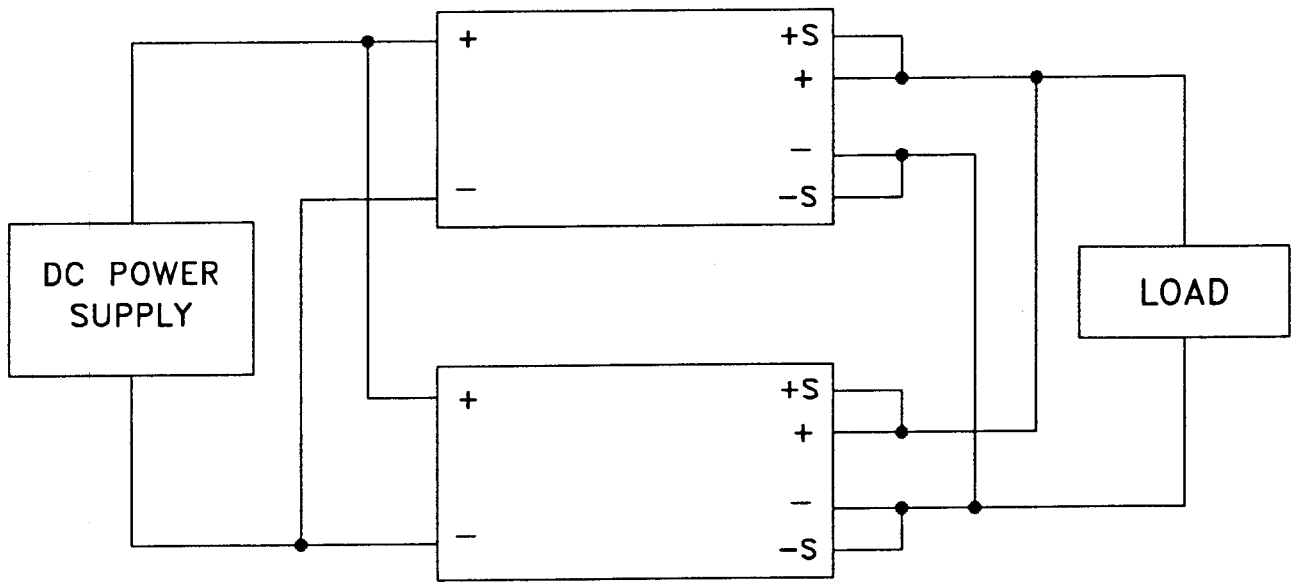


FIGURE 7 CONNECTION FOR PARALLEL OPERATION OF THE FPD 100W-150 POWER SUPPLY

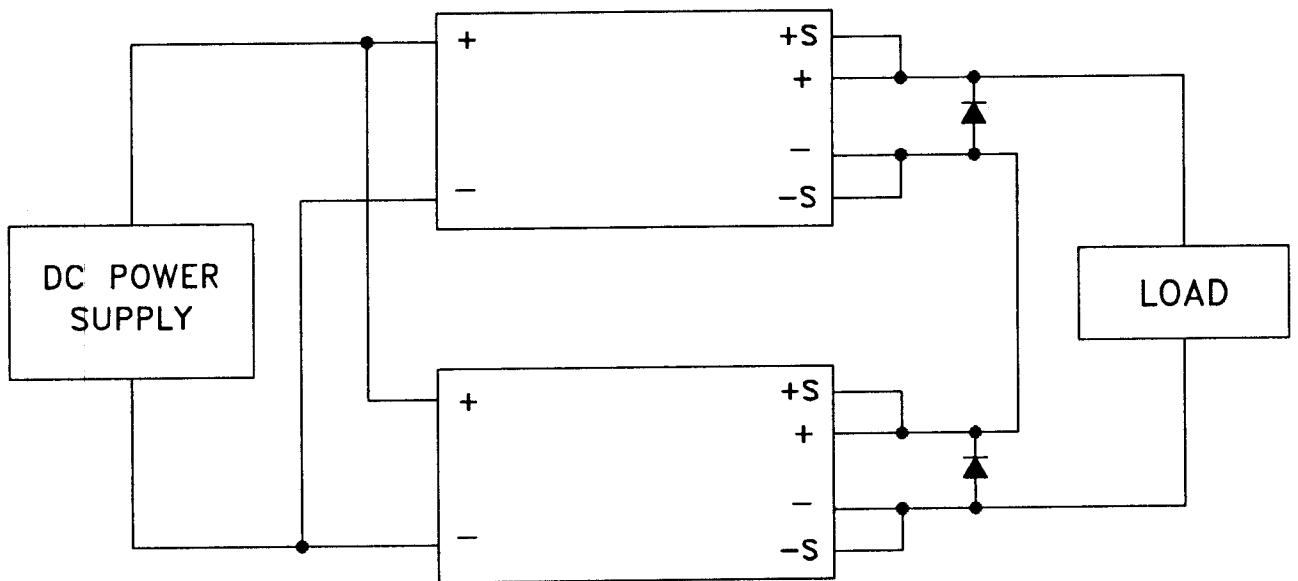


FIGURE 8 CONNECTION FOR SERIES OPERATION OF THE FPD 100W-150 POWER SUPPLY