

# OPERATOR'S MANUAL

## FPD 10-48W POWER SUPPLY SERIES

Flat Pack Single Output DC to DC Converter

KEPCO INC.  
An ISO 9001 Company.

### MODEL FPD 10-48W 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 brief contains information for the installation and operation of the Kepco FPD 10-48W DC to DC Converter Series of switching power supplies. For further operating and service information for the FPD 10-48W 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 10-48W DC to DC Converter Series consists of four switching power supplies, having a nominal 24-48 Vdc input and different DC output voltages, rated as listed in Section II. FPD 10-48W 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 by an isolated TTL level 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 5-2-48W	24-48 Vdc	5 Vdc 2A
FPD 12-0.8-48W	24-48 Vdc	12 Vdc 0.8A
FPD 15-0.65-48W	24-48 Vdc	15 Vdc 0.65A
FPD 24-0.4-48W	24-48 Vdc	24 Vdc 0.4A

**NOTE:** Normal conditions are nominal input, nominal output, and 25 degrees C.

## III SPECIFICATIONS:

Nominal Input Voltage:	24-48 Vdc
Input Voltage Range:	20-56 Vdc
Input Current:	0.5A Typical 0.7A maximum at 24 Vdc Input 0.3A Typical 0.4A maximum at 48 Vdc Input
Efficiency:	80 percent Typical 24 Vdc Input 76 percent Typical 48 Vdc Input
Switching Frequency:	500~700 kHz Typical
Circuit Type:	Forward Converter

#### IV OUTPUT SPECIFICATIONS:

MODEL	FPD 5-2K	FPD 12-0.8K	FPD 15-0.65K	FPD 24-0.4K
Output Voltage Nominal	5V	12V	15V	24V
Output Current Nominal	2A	0.8A	0.65A	0.4A
Output Power Maximum (Fig. 9)	10W	9.6W	9.75W	9.6W
Voltage Adjustment Range	± 10 percent with external trimmer and resistor (see Figures 4A and 4B)			
Output Voltage Accuracy	± 5 percent Maximum			
Ripple, Maximum 0-50 Degrees C 10-100 % Load	200mV p-p	200mV p-p	200mV p-p	300mV 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 – Foldback Winker Operation Characteristic	2.4~4.0A	1.0~1.6A	0.8~1.3A	0.5~0.8A
Overvoltage Setting Shut Down Characteristic	5.5~6.9V	13.2~15.7V	16.5~19.0V	26.4~31.5

Source Effect	1% Typical — 2% Maximum (20-30 Vdc, 40-56 Vdc Input)
Load Effect	1% Typical — 2% Maximum (10-100% Load)
Temperature Effect	1% Typical — 2% Maximum (0-50 Degrees C)
Combined Effect	2.5% Typical — 5% 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 (See Figure 3)

#### V GENERAL SPECIFICATIONS

SPECIFICATIONS	CONDITIONS	
Temperature	Operating 0~71 Degrees C Storage – 40 ~ 75 Degrees C	
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 3 axis
Shock	20 G 11± 5 ms Pulse Duration	Non-Operating, 1/2 Sine Pulse - 3 Shocks each axis
Withstand Voltage	Input-Output: 500 Vdc 1 minute	
Isolation Resistance	Input-Output Output-Signal Ground: >100M ohm, 500 Vdc	at 25 degrees C 65 percent RH
Dimensions	2.0 (50.8) x 2.0 (50.8) x 0.33 (8.5)	
Weight	1.06 oz. (30 grams) Typical, 1.41 oz. (40 grams) Maximum	
Cover Material	Plastic (UL94V-O) With Aluminum Base	

## VI REMOTE ON/OFF:

A TTL compatible logic signal between the RC terminal and the minus input side of the FPD 10-48W DC to DC Converter can be used to control the Power Supply as follows:

Power ON	H Level	2.4-24V or open
Power OFF	L Level	0.4V or short

## VII EXTERNAL OUTPUT VOLTAGE CONTROL

The output voltage of the DC to DC Converter can be controlled (to within  $\pm 10$  percent) by placing a resistor between the RV1 and RV2 terminals, and a trimmer between the RV2 and (-) output terminals, see Figure 4A and the following table.

<b>OUTPUT</b>	<b>V</b>	<b>5V</b>	<b>12V</b>	<b>15V</b>	<b>24V</b>
<b>TRIMMER</b>	ohms	5K	10K	10K	10K
<b>RESISTOR</b>	ohms	270	8.2K	12K	33K

## VIII EXTERNAL POWER SUPPLY CONTROL

Applications in which the FPD 10-48W DC to DC Converter is controlled by fixed and trimmer resistors (at terminals RV1 and RV2) and in which the connecting lines to the Converter are long (over 7.9 in. (20cm)), may result in a malfunctioning Power Supply. For these situations connect a capacitor, no more than 1000 pF, across the lines and as close as possible to terminals RV1 and RV2 (see Figure 4B).

## IX APPLICATIONS

For applications where the input lines to the DC to DC Converter are long (over 7.9 in. (20cm)), the output voltage waveform may show extra oscillations attributable to line inductance or noise. To reduce these oscillations place a capacitor (about 100  $\mu$ f) across the input terminals of the Converter (and as close to them as possible) see Figure 5.

## X COMMON MODE NOISE SUPPRESSION

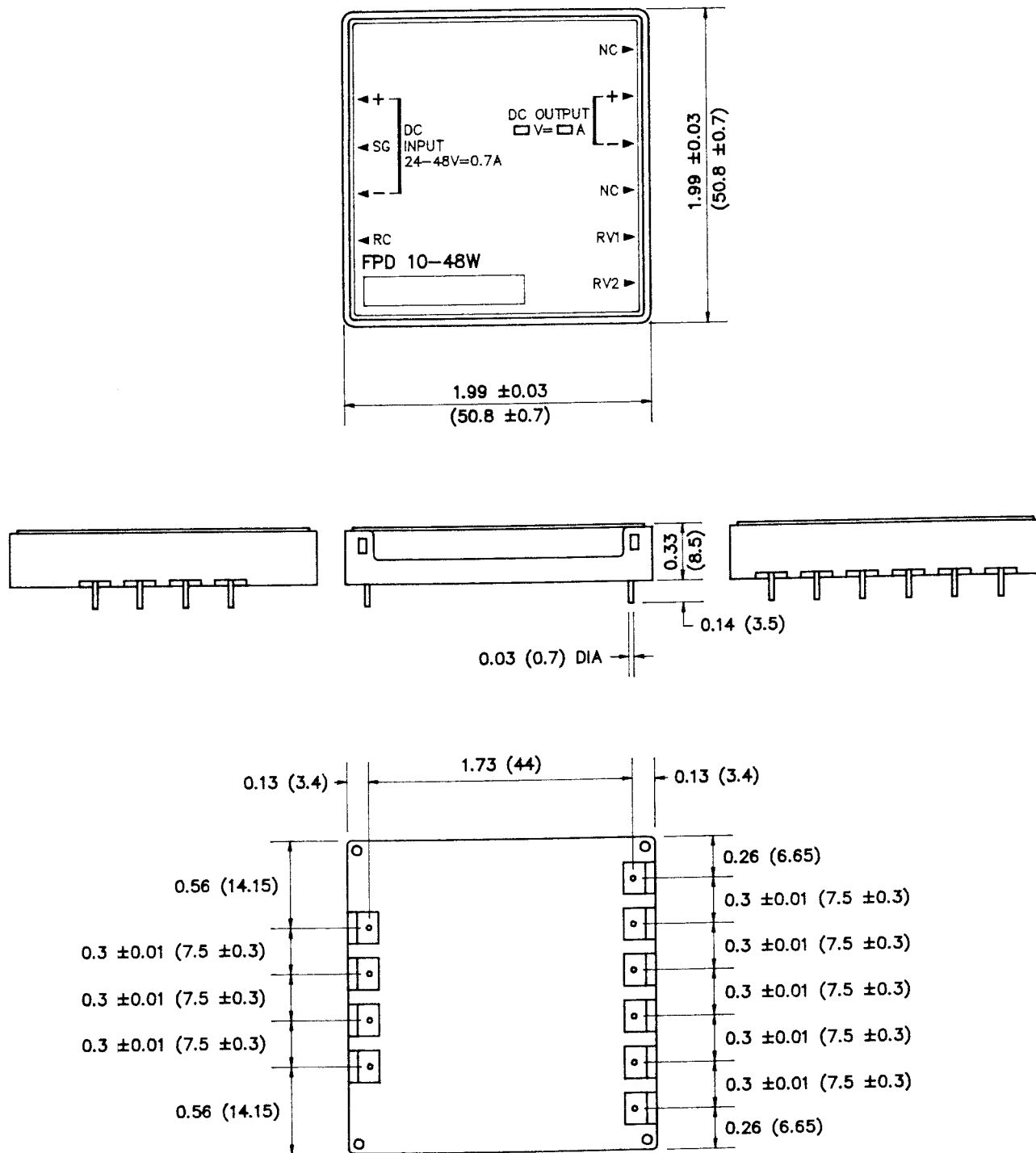
For applications where the load lines from the DC to DC Converter are long (over 19.7 in. (50cm)) the output voltage waveform may show extra oscillations attributable to line inductance or noise. Use a common mode noise suppression circuit to reduce mutual interference and ground loop noise (see Figure 6).

## XI EXTERNAL SURGE VOLTAGE

Applications where voltage surges (external) are present at the input terminals to the DC to DC Converter may result in a malfunctioning Power Supply. To reduce the effects of these voltage surges use a noise suppression circuit (see Figures 7A and 7B).

## XII OVERVOLTAGE PROTECTION CHARACTERISTIC

When the output voltage of the FPD 10-48W exceeds the level specified in Section IV, the Power Supply shuts down (see Figure 8). To reset the DC to DC converter it is then necessary to disconnect the DC input power lines from the unit and reconnect the input lines before turning ON the Power Supply.

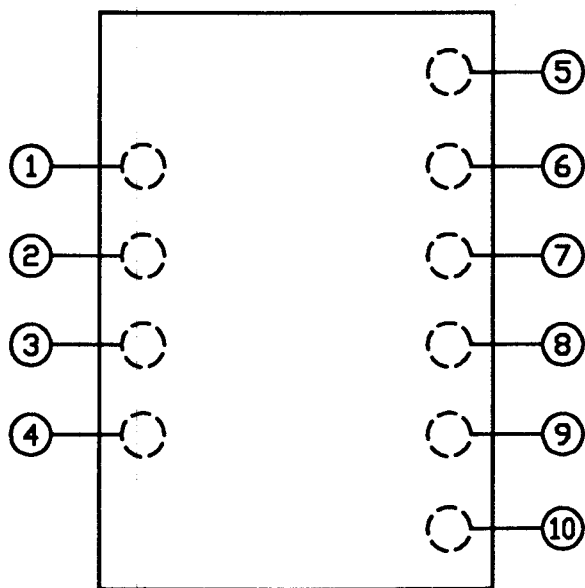


NOTES:

1. DIMENSIONS IN PARENTHESIS ARE IN MILLIMETERS, ALL OTHERS ARE IN INCHES.
2. ±0.02 in. (±0.5 mm) TOLERANCE UNLESS OTHERWISE SPECIFIED.

FIGURE 1 MECHANICAL OUTLINE DRAWING OF THE FPD 10-48W DC TO DC CONVERTER

## TERMINAL LOCATION



TOP VIEW

- ① DC INPUT (+)
- ② SIGNAL GROUND (SG)
- ③ DC INPUT (-)
- ④ REMOTE ON-OFF CONTROL (RC)
- ⑤ NC
- ⑥ DC OUTPUT (+)
- ⑦ DC OUTPUT (-)
- ⑧ NC
- ⑨ REMOTE VOLTAGE CONTROL (RV1)
- ⑩ REMOTE VOLTAGE CONTROL (RV2)

NOTE: ② SG TERMINAL MUST BE CONNECTED TO TERMINAL ① (+) OR ③ (-)  
② SG TERMINAL IS CONNECTED TO ALUMINUM BASE.

FIGURE 2 TERMINAL LOCATIONS OF THE FPD 10-48W DC TO DC CONVERTER

# RECOVERY CHARACTERISTIC

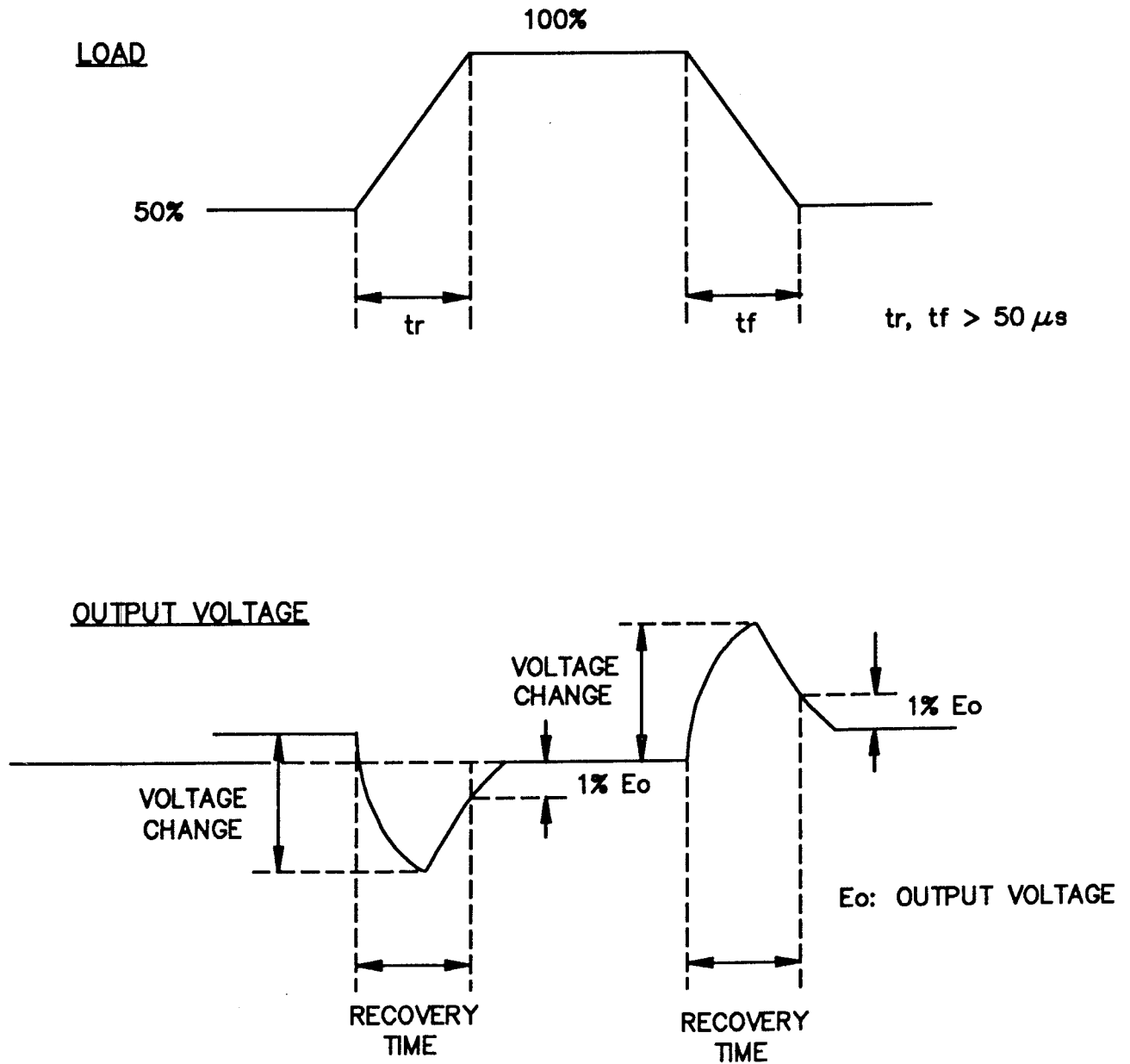
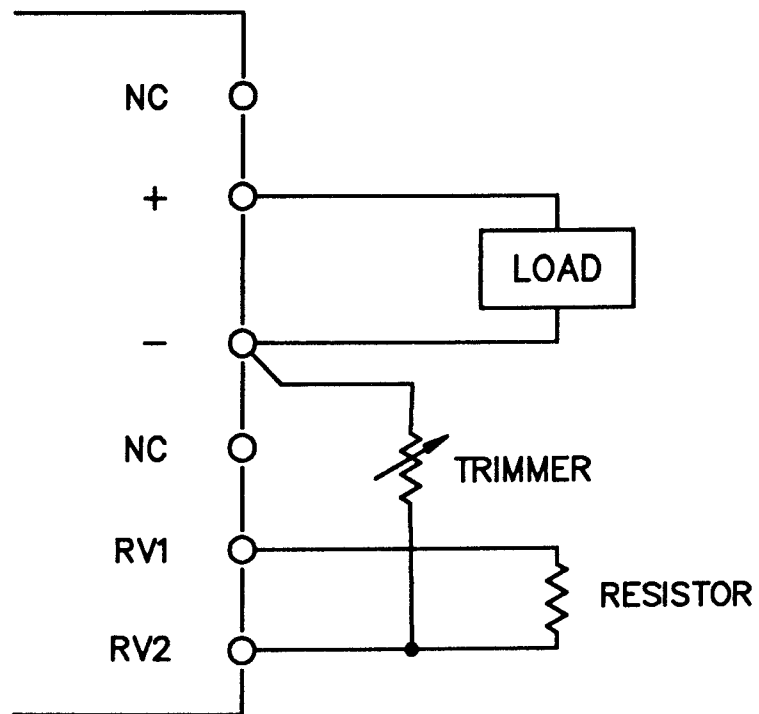


FIGURE 3 THE RECOVERY CHARACTERISTICS OF THE FPD 10-48W DC TO DC CONVERTER

## EXTERNAL OUTPUT VOLTAGE TRIMMING



## EXTERNAL OUTPUT VOLTAGE TRIMMING (WHEN CONNECTING LINES TO THE UNIT ARE LONG)

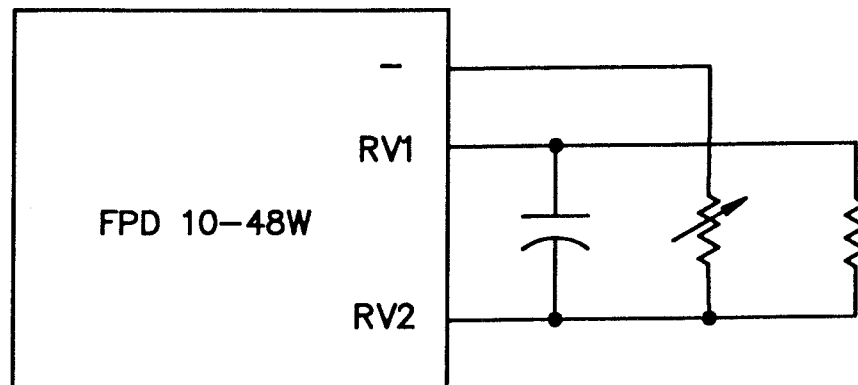


FIGURE 4A (TOP) EXTERNAL OUTPUT VOLTAGE TRIMMING FOR THE FPD 10-48W DC TO DC CONVERTER

FIGURE 4B (BOTTOM) FPD 10-48W APPLICATION WHERE THE CONNECTING LINES TO THE DC TO DC CONVERTER ARE LONG



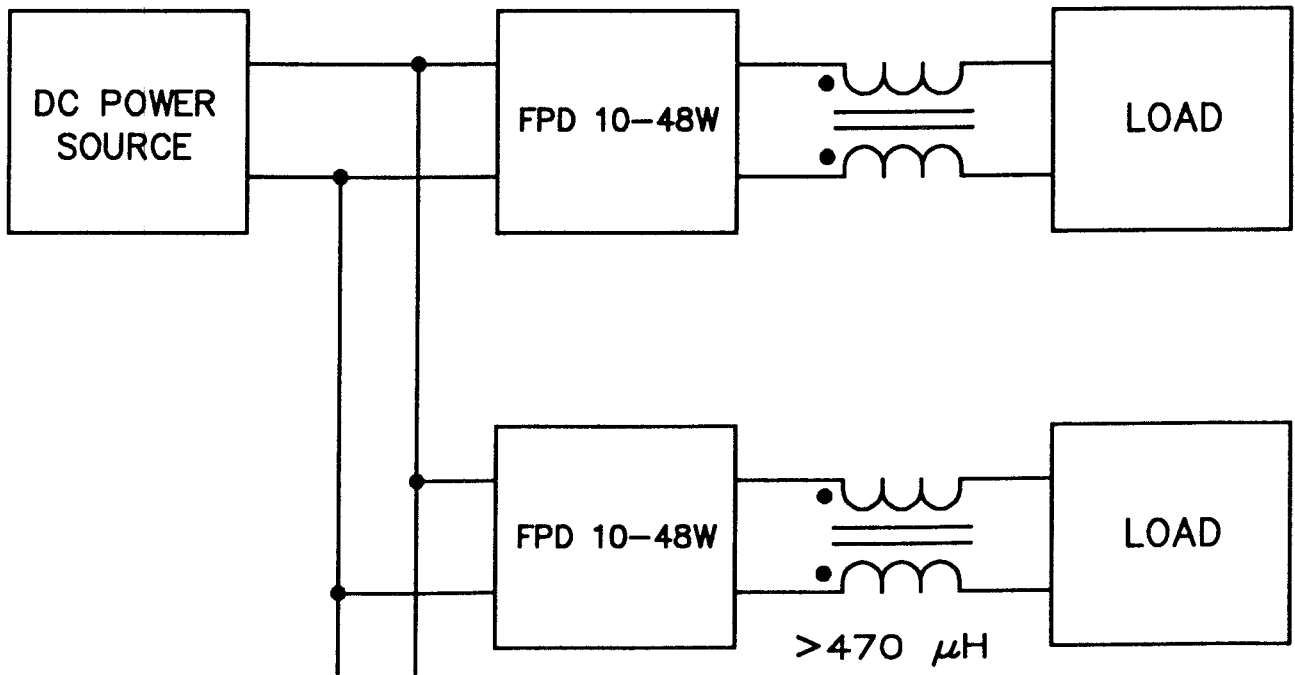
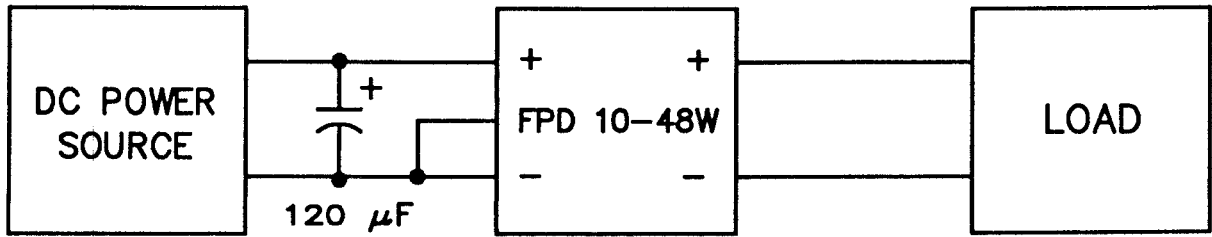
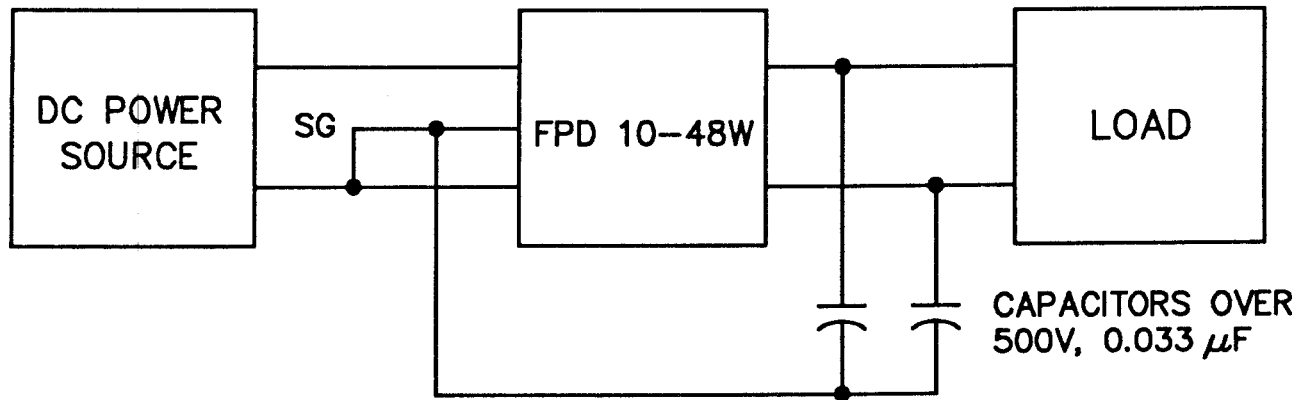


FIGURE 5 (TOP) FPD 10-48W APPLICATION WHERE THE INPUT LINES TO THE DC TO DC CONVERTER ARE LONG

FIGURE 6 (BOTTOM) A COMMON MODE NOISE SUPPRESSION CIRCUIT TO REDUCE MUTUAL INTERFERENCE AND GROUND LOOP NOISE IN THE DC TO DC CONVERTER

## CONNECTION WITH ISOLATION



## CONNECTION WITHOUT ISOLATION

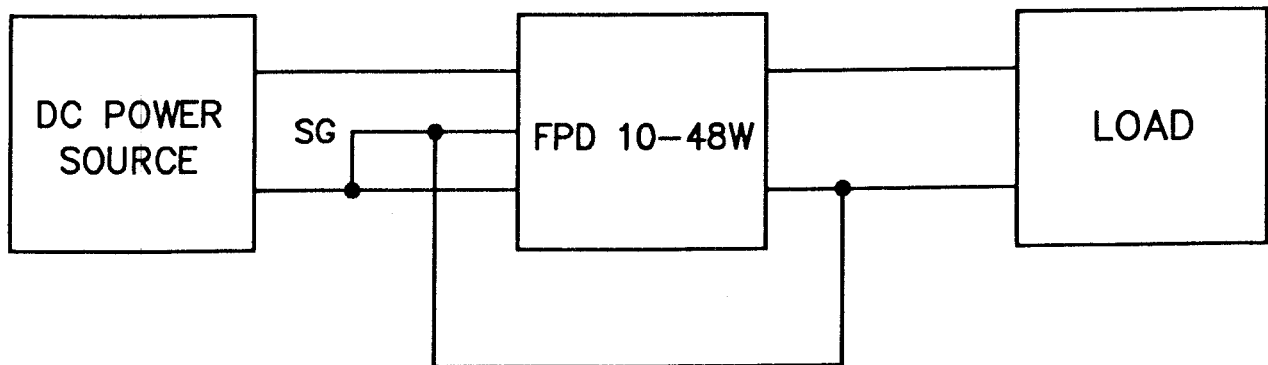


FIGURE 7A (TOP) FPD 10-48W APPLICATION WHERE VOLTAGE SURGES ARE PRESENT AT THE INPUT TERMINALS TO THE DC TO DC CONVERTER—NOISE SUPPRESSION CIRCUIT WITH ISOLATION

FIGURE 7B (BOTTOM) FPD 10-48W APPLICATION WHERE VOLTAGE SURGES ARE PRESENT AT THE INPUT TERMINALS TO THE DC TO DC CONVERTER—NOISE SUPPRESSION CIRCUIT WITHOUT ISOLATION

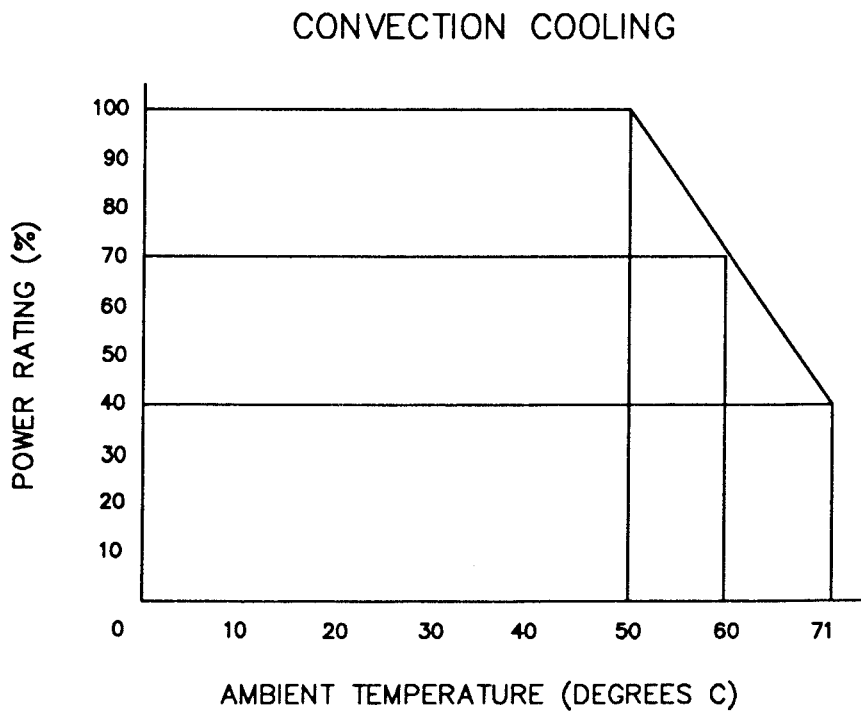
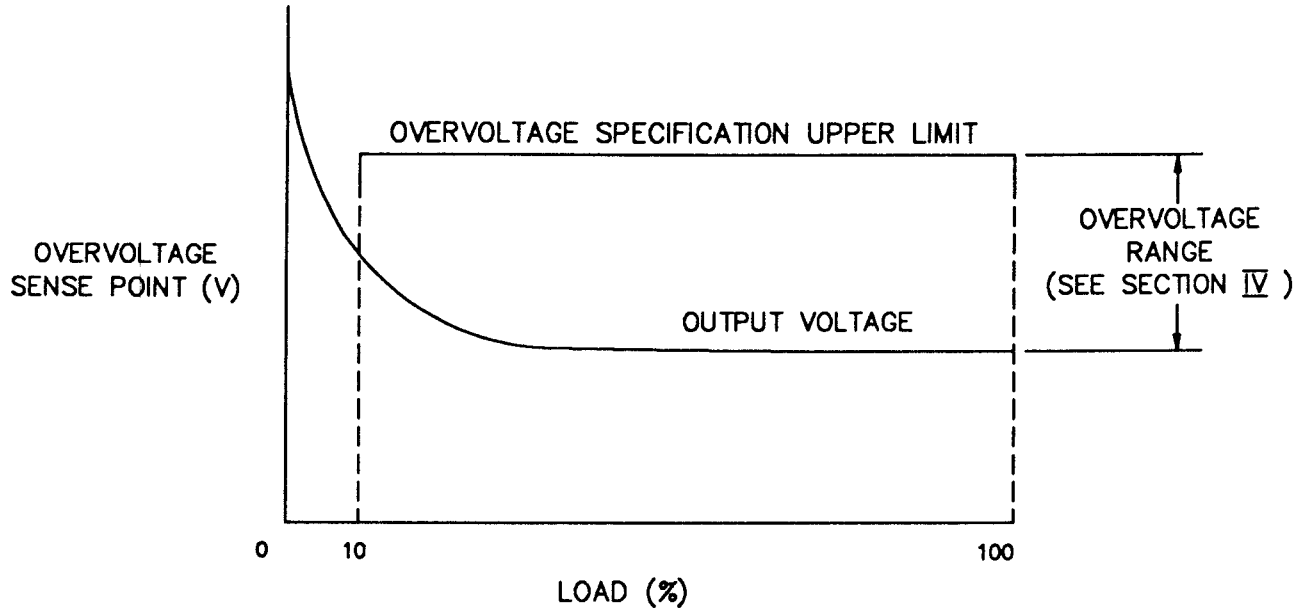


FIGURE 8 (TOP) OVERLOAD PROTECTION CHARACTERISTIC FOR THE FPD 10-48W DC TO DC CONVERTER

FIGURE 9 (BOTTOM) A PLOT OF PERCENT OUTPUT RATING VERSUS AMBIENT TEMPERATURE (WITH CONVECTION COOLING) FOR THE FPD 10-48W DC TO DC CONVERTER