INTERNATIONAL POWER
DC POWER SUPPLIES

SPECIFICATIONS AND APPLICATIONS
OPEN FRAME SERIES

SERIES DESCRIPTION

The INTERNATIONAL POWER open frame series is a high reliability line of power supplies designed to operate over a wide range of AC power sources found worldwide. This feature simplifies your inventory and service consideration by allowing the use of one standard power supply regardless of destination.

These models are designed to meet many domestic and European regulatory agency requirements. If you plan to distribute your products worldwide, obtaining necessary agency approvals can be greatly simplified by specifying the INTERNATIONAL POWER open frame series.

FEATURES

- VDE transformer construction
- 100/120/220/230-240 VAC input
- OVP on 5V outputs
- ± .05% Regulation
- Remote sense on most outputs
- Industry standard case size
- Full rated to 50 degrees C
- Foldback/Current Limit
- Two hour burn-in
- Two-year warranty
- U.L. Recognized, for U.S.A. and CANADA File E133338
- TUV Rheinland Licensed
- Chassis notched for AC Input
- Input accepts .110 x .032 fast-ons or solder connection

SPECIFICATIONS

AC INPUT:	100/120/220/230-240 VAC +10% -13%, 47-63 Hz. See chassis AC connection table for jumper and line fusing requirements. Derate output current 10% for 50Hz operation. Tolerance for 230-240 volt operation is +15% - 10%
DC OUTPUT:	Adjustment range ± 5% minimum.
LINE REGULATION:	± .05% for a 10% line change.
LOAD REGULATION:	± .05% for a 50% load change.
TRANSIENT RESPONSE:	Less than 50 µSEC for a 50% load change.
OUTPUT RIPPLE:	5 Volt to 28 Volt units: 5mV pk-pk maximum. 48 Volt to 155 Volt units: .02% pk-pk maximum. 200 Volt & 250 Volt units: .05% pk-pk maximum.
SHORT CIRCUIT AND OVERLOAD PROTECTION:	Automatic current limit/foldback.
OVERVOLTAGE PROTECTION:	Built in on all 5 Volt output. Set at 6.2 ± .4 Volts. Other outputs use overvoltage protection modules.
REMOTE SENSING:	Provided on most models. Open sense lead protection built in on most models.
EFFICIENCY (TYPICAL):	5 Volt units: 45%; 12 and 15 Volt units: 55%; 24 through 250 Volt units: 60%.
STABILITY:	±.3% for 24 hour period after 1 hour warm up.
TEMPERATURE RATING:	0° C to 50° C for full rated, derated linearly to 40% at 70°C.
TEMPERATURE COEFFICIENT:	.01%/°C typical, .03%/°C Maximum.
VIBRATION:	Per MIL-STD-810D, Method 514.3, Category 1, Procedure 1.
SHOCK:	Per MIL-STD-810D, Method 516.3, Procedure 3.
EMI/RFI:	These linear power supplies have inherently low conducted and radiated noise levels. For most systems applications, they meet the requirements of FCC Docket 20780 class B equipment and VDE 0871 class B equipment.

SAFETY SPECIFICATIONS

The INTERNATIONAL POWER supplies are in compliance with the requirements for the following specifications: For U.S. and Canadian (Bi-National) Standards UL 1950, Third Edition, CAN/CSA C22.2 No. 950-95, IEC950, TUV Rheinland EN 60950: 1992 + A1 + A2 + A3 + A4 + A11 Specifically, field terminal to terminal spacing is 5.25 mm with 9.0 mm creepage to other metal, leakage current is less than 50uA and dielectric withstand voltages are 3750 VAC input to chassis, 3750 VAC input to output and 750 VDC output chassis. UL tested at 4242 VDC input to output, 2121 VDC input to dead metal.

OVERVOLTAGE PROTECTION

An overvoltage protection circuit, commonly referred to as a crowbar, is used to prevent damage to voltage-sensitive loads such as TTL logic. Trip point of the OVP is usually set at 115%-135% of the output voltage. The OVP will short the output terminals upon sensing a fault condition. The primary fuse of the supply will blow if the supply is not foldback current limited. Nuisance tripping of the OVP is a common problem. Noise from input line spikes or load noise can cause an OVP to fire. INTERNATIONAL POWER has incorporated OVP noise filtering to prevent nuisance tripping and reduced transformer interwinding capacitance to minimize input line susceptibility.

COMMON-MODE LATCH UP

In certain instances dual power supplies can exhibit a problem known as common-mode latch up. This occurs when the positive supply comes up first and forces a reverse bias condition on the negative supply. The negative supply latches up in a current limit condition. INTERNATIONAL POWER has incorporated a unique anti-latch circuit into every dual power supply which will minimize this problem.

WARRANTY

INTERNATIONAL POWER warrants each power supply of its manufacture that does not perform to published specifications as a result of defective materials or workmanship for a period of two full years from the date of original delivery.

INTERNATIONAL POWER assumes no liabilities for consequential damages of any kind through the use or misuse of its products by the purchaser or others. No other obligations or liabilities are expressed or implied.

CUSTOMER SERVICE REPAIR

Please follow this procedure when returning product for repair:

Contact INTERNATIONAL POWER for a returned material authorization (RMA) number. The RMA number must appear on all shipping documents and containers. Returns must be freight prepaid. Returns shipped freight collect or without an RMA will not be accepted.

INTERNATIONAL POWER
360 Bernoulli Circle
Oxnard, CA 93030-5167

Phone: (805) 981-1188
FAX: (805) 981-1184

Applications

Remote Sense

Remote sense terminals may be used to compensate for output line losses and provide for a remote point of regulation. *Figure I* shows the proper termination for a power supply with remote sensing.

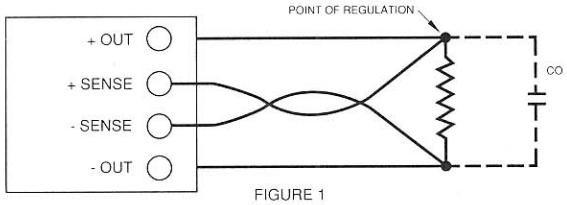


FIGURE 1

Load lines must be sized to prevent an excessive voltage drop from the output to the load. Since the point of regulation is at the load, the power supply must compensate for line losses. Excessive load line losses may affect current limiting, AC line dropout point and OVP margin (if applicable).

Leads should be sized to drop no more than 0.5V – the less the better. Use of a twisted pair or shielded pair for the sense lines is recommended for noise immunity. In problem applications, the use of a small AC decoupling capacitor (.1 to 10µ Fd) across the sense terminals is highly recommended. In some applications there may be a tendency for the power supply to oscillate due to the additional phase shift caused by the series resistance and inductance in the load leads. The addition of capacitor Co will reduce output impedance and provide stability. The recommended value of Co is 100µ Fd per ampere or 50µ Fd per foot and can be the sum of the distributed decoupling capacitors found in most systems. INTERNATIONAL POWER supplies have open sense lead protection on most outputs to protect the load from an overvoltage condition if the sense leads are removed. There is no need to strap the sense terminals to the output terminals in the local sense mode.

Overvoltage Protection (OVP)

An overvoltage protection circuit, commonly referred to as a crowbar, is used to prevent damage to voltage sensitive loads such as TTL logic. Trip point of the OVP is usually set at 115% - 135% of the output voltage. The OVP will short the output terminals upon sensing a fault condition. The primary fuse of the supply will blow if the supply is not foldback current limited. Nuisance tripping of the OVP is a common problem. Noise from input line spikes or load noise can cause an OVP to fire. INTERNATIONAL POWER has provided OVP noise filtering to prevent nuisance tripping and reduced transformer interwinding capacitance to minimize input line susceptibility.

Common-Mode Latch UP

In certain instances dual power supplies can exhibit a problem known as common-mode latch up. This occurs when the positive supply comes up first and forces a reverse bias condition on the negative supply. The negative supply latches up in a current limit condition. INTERNATIONAL POWER has incorporated a unique antilatch circuit into every dual power supply which will minimize this problem.

Grounding

Grounding considerations in designing a power distribution system are often overlooked but can have a significant impact on overall system performance. A single point system ground should be employed where possible to eliminate ground loops and improve regulation.

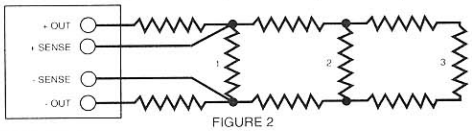


FIGURE 2

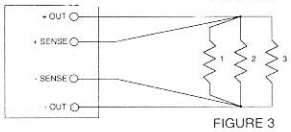


FIGURE 3

Figure 2 shows a simple but *undesirable* connection scheme.Regulation at loads 2 and 3 becomes progressively worse due to voltage drops in the finite wire resistance between loads. *Figure 3* shows an improved connection system in which regulation is maintained at all three loads because wire losses are not cumulative.

AC Connection and Fusing

The five wire input provides four voltage ranges: 100/120/220/230-240** +10%, -13%. See chassis AC connection table for the jumpering requirements. Extended low line tolerance provides additional drop out margin in areas where line voltages are marginal. Inputs must be fused.

AC Input	47-63-Hz			
For use at	100 VAC	120 VAC	220 VAC	230/240 VAC
JUMPER	1 & 3 2 & 4	1 & 3 2 & 4	2 & 3	2 & 3
Apply AC	1 & 5	4 & 1	1 & 5	4 & 1

FUSING REQUIREMENTS ARE SILKSCREENED ON EACH INDIVIDUAL POWER SUPPLY

FIGURE 4

**Tolerance for 230VAC operation is +15%, -10%.

Jumpering Example

Figure 5 is an example of proper jumpering of the primary for 100/120 VAC operation.

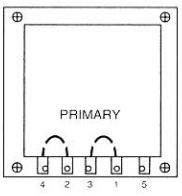


FIGURE 5

Warranty

INTERNATIONAL POWER warrants each power supply of its manufacture that does not perform to published specifications as a result of defective materials or workmanship for a period of two full years from the date of original delivery.

INTERNATIONAL POWER assumes no liabilities for consequential damages of any kind through the use or misuse of its products by the purchaser or others. No other obligations or liabilities are expressed or implied.

Customer Service/Warranty Repair

Please follow this procedure when returning product for customer service: Contact INTERNATIONAL POWER DC POWER SUPPLIES, INC. for a returned material authorization (RMA) number. The RMA number must appear on all shipping containers. Returns must be returned freight prepaid. Returns shipped freight collect or without an RMA number will not be accepted.

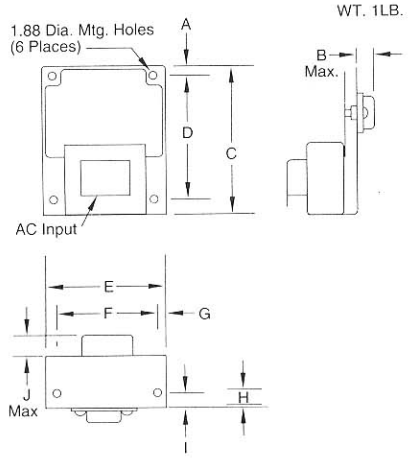
Ship to: INTERNATIONAL POWER

360 Bernoulli Circle • Oxnard, CA 93030-5167 • (805) 981-1188 • FAX (805) 981-1184 • (800) 845-5386

Outline and Mounting Drawings

A Case

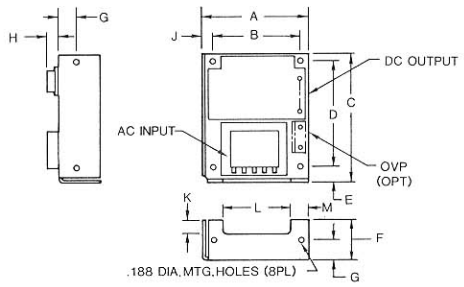
Overall Size: 3.75″ x 3.00″ x 2.20″
Weight 1 lb.



	INCH	mm
A	.250	6.35
B	.450	11.43
C	3.75	95.25
D	3.100	78.74
E	3.00	76.20
F	2.500	63.50
G	.250	6.35
H	1.25	31.75
I	.350	8.89
J	.500	12.70

B Case

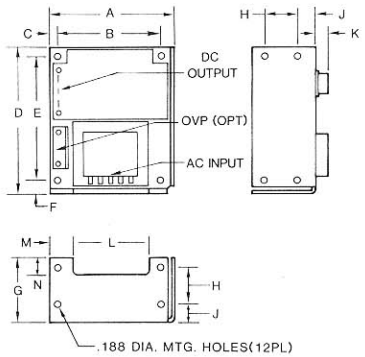
Overall Size: 4.87″ x 4.00″ x 2.10″
123.70mm x 101.60mm x 53.34mm
Weight 2 lbs.



	INCH	mm
A	4.00	101.60
B	3.375	85.73
C	4.87	123.70
D	4.125	104.78
E	0.50	12.70
F	1.62	41.15
G	0.75	19.05
H	0.450	11.43
J	0.38	9.65
K	0.57	14.48
L	2.60	66.04
M	0.794	20.17

C Case

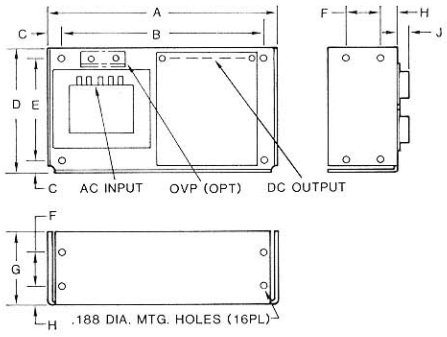
Overall Size: 5.62″ x 4.87″ x 2.95″
142.75mm x 123.70mm x 74.93mm
Weight 4 lbs.



	INCH	mm
A	4.87	123.70
B	4.125	104.78
C	0.25	6.35
D	5.62	142.75
E	4.875	123.83
F	0.50	12.70
G	2.50	63.50
H	1.250	31.75
J	0.75	19.05
K	0.450	11.43
L	2.85	72.39
M	1.025	26.04
N	0.665	16.89

D Case

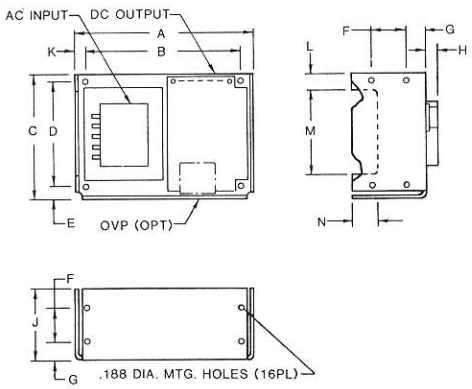
Overall Size: 9.00″ x 4.87″ x 3.28″
228.60mm x 123.70mm x 83.83mm
Weight 7.5 lbs.



	INCH	mm
A	9.00	228.60
B	8.000	203.20
C	0.50	12.70
D	4.87	123.70
E	4.125	104.78
F	1.250	31.75
G	2.75	69.85
H	0.75	19.05
J	0.450	11.43

N Case

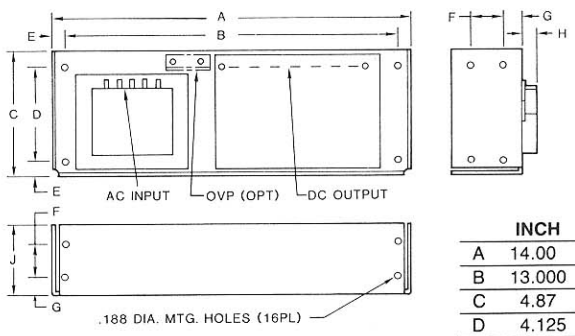
Overall Size: 7.00″ x 4.87″ x 3.20″
177.80mm x 123.70mm x 81.28mm
Weight 6 lbs.



	INCH	mm
A	7.00	177.80
B	6.250	158.75
C	4.87	123.70
D	4.125	104.78
E	0.50	12.70
F	1.250	31.75
G	0.75	19.05
H	0.450	11.43
J	2.75	69.85
K	0.38	6.35
L	0.640	16.26
M	3.345	84.96
N	1.00	25.40

E Case

Overall Size: 14.00″ x 4.87″ x 3.53″
355.60mm x 123.70mm x 89.66mm
Weight 10 lbs.

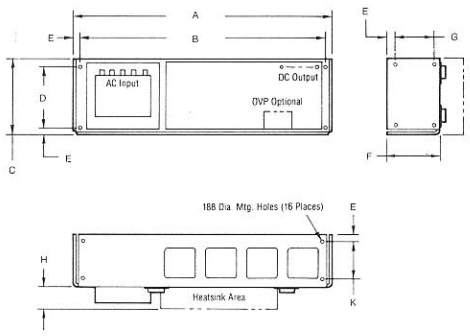


	INCH	mm
A	14.00	355.60
B	13.000	330.20
C	4.87	123.70
D	4.125	104.78
E	0.50	12.70
F	1.250	31.75
G	0.75	19.05
H	0.650	16.51
J	2.75	69.85

Outline and Mounting Drawings

F Case

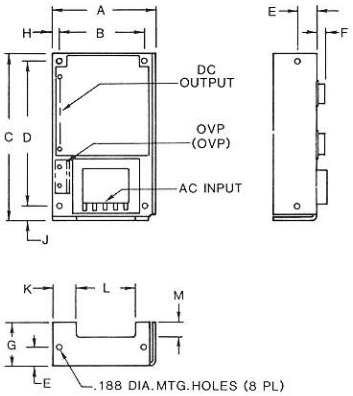
Overall Size: 16.75″ x 5.50″ x 4.88″
Weight 19 lbs.



	INCH	mm
A	16.75	425.45
B	16.00	406.40
C	4.88	123.95
D	4.125	104.80
E	0.375	9.53
F	5.00	127.00
G	2.50	63.50
H	1.50	36.10
J	3.50	88.90
K	2.50	63.50

AA Case

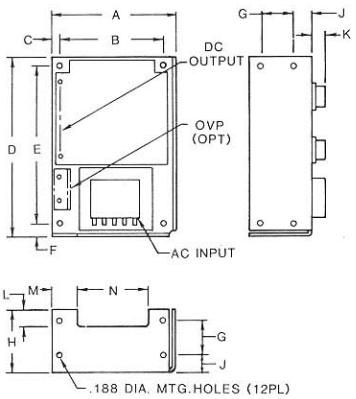
Overall Size: 6.50″ x 4.00″ x 2.10″
165.10mm x 101.60mm x 53.34mm
Weight 2 lbs.



	INCH	mm
A	4.00	101.60
B	3.375	85.73
C	6.50	165.10
D	5.750	146.05
E	0.75	19.05
F	0.450	11.43
G	1.62	41.15
H	0.25	6.35
J	0.50	12.70
K	0.955	24.26
L	2.37	60.20
M	0.57	14.48

BB Case

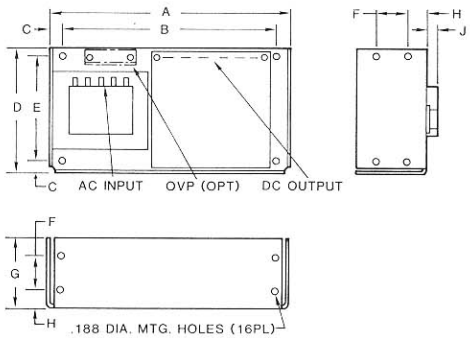
Overall Size: 7.00″ x 4.88″ x 2.95″
177.80mm x 123.95mm x 74.93mm
Weight 4 lbs.



	INCH	mm
A	4.87	123.70
B	4.125	104.78
C	0.25	6.35
D	7.00	177.80
E	6.250	158.75
F	0.50	12.70
G	1.250	31.75
H	2.50	63.50
J	0.75	19.05
K	0.450	11.43
L	0.665	16.89
M	1.025	26.03
N	2.85	72.39

CC Case

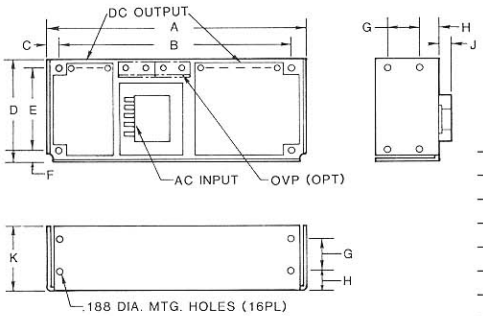
Overall Size: 9.38″ x 4.87″ x 3.28″
238.25mm x 123.70mm x 83.31mm
Weight 7 lbs.



	INCH	mm
A	9.38	238.25
B	8.375	212.73
C	0.50	12.70
D	4.87	123.70
E	4.125	104.78
F	1.250	31.75
G	2.75	69.85
H	0.75	19.05
J	0.450	11.43

BAA Case

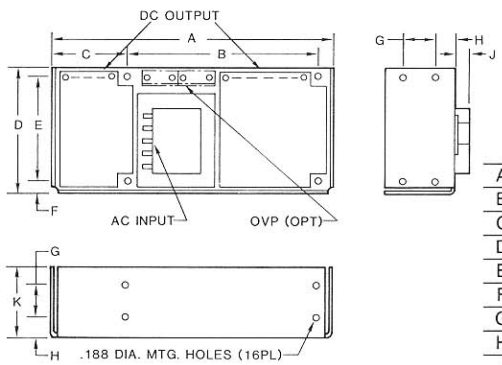
Overall Size: 10.25″ x 4.00″ x 2.95″
260.35mm x 101.60mm x 74.93mm
Weight 5 lbs.



	INCH	mm
A	10.25	260.35
B	9.250	234.95
C	0.50	12.70
D	4.00	101.60
E	3.375	85.73
F	0.37	9.40
G	1.250	31.75
H	0.75	19.05
J	0.450	11.43
K	2.50	63.50

CBB Case

Overall Size: 11.00″ x 4.87″ x 3.28″
279.40mm x 123.70mm x 83.31mm
Weight 8 lbs.



	INCH	mm
A	11.00	279.40
B	7.50	190.50
C	3.00	76.20
D	4.87	123.70
E	4.125	104.78
F	0.50	12.70
G	1.250	31.75
H	0.75	19.05
J	4.50	11.43
K	2.75	69.85