



WESTCOR

T-57-11
WESTCOR CORPORATION485-100 Alberto Way
Los Gatos, CA
95032
(408) 395-7050

Design Data Sheet

Westcor VI-100™ Series

Actual Size

Megahertz DC-DC Converter Modules

Power: Up to 150 watts/
module; kilowatts
via Gating Pin Paralleling™

Outputs: 2 to 48 VDC
Inputs: 10 to 375 VDC

VI-100 SERIES REGULATED DC TO DC CONVERTERS**FEATURES:**

- Small size, low profile 2.4" x 4.6" x .47"
- Light weight 4 oz. nominal
- High Power Density Up to 50 watts/cubic inch^①
- High Efficiency 80^② to 90%
- High Reliability 214,000 hours MTBF at 80°C (Mil 217D)
- Designed to Meet UL, CSA, TUV (VDE)^③
- Isolation Off-line — 3750 VAC agency required hipot.
Up to 48 volt input — 1500 VDC
- Encapsulated, Rugged Mil 810 shock and vibration
- Component Package Standard-size modules permit quick "step and repeat" design-in for most applications
- Long Life No life-limited components, no electrolytic capacitors

■ Performance

Meets or exceeds all standard switching power supply specifications

■ Noise

Less than 1% P-P, DC to 20 MHz

■ Load Regulation

Less than 0.3% max.

■ Line Regulation

Less than 0.2% max.^④**DESIGNED FOR THESE APPLICATIONS:**

- Computer — Off-line inputs up to 375 VDC; low noise; component design; electrically and mechanically designed for distributed power.
- Telecommunications — 24 and 48 VDC input; low stand-by drain, less than 1W.
- Military — 28 VDC input; 400 Hz ripple rejection; rugged; specially tested military "M" grade modules.
- Industrial — Encapsulated; rugged; specially tested industrial "I" models.
- Medical — UL 544 leakage.
- Test and Measurement — Small size; light weight for portable instrumentation; low input voltage models.

GENERAL DESCRIPTION

Westcor's VI-100™ series is the industry standard 1 Megahertz DC to DC converter. Westcor's patented modules operate at a frequency of 1 MHz, or five to fifty times that of competitive units. Megahertz operation, coupled with other proprietary elements of Westcor's design, attains small size, higher efficiency, and lower noise. The VI-100 series is by design "high reliability" and rugged. Designed to meet UL, CSA, and TUV (VDE), VI-100's feature: adjustable outputs, remote sense, OVP, output current limit, logic inhibit, floating outputs, isolation, and simple paralleling via "Gating Pin Paralleling"™ for current sharing.

VI-100 SERIES SELECTOR GUIDE — MEGAHERTZ DC-DC CONVERTERS

EXAMPLE: MODEL VI-160-X

Westcor's Industry Standard
Megahertz Converter —
VI-100™ Series

Nominal Input Voltage

6 : 300 VDC
5 : 150 VDC
3 : 48 VDC
2 : 36 VDC —
"wide mouth"
1 : 24 VDC
0 : 12 VDC

Product Grade:

-C or Blank: "Commercial"
grade module
-I: "Industrial"
grade module
-M: "Military" grade
module

Note: See product grades in
data sheet.

Output Voltage:

0 : 5 volt
1 : 12 volt
2 : 15 volt
3 : 24 volt
4 : 48 volt
Z : 2 volt

NOMINAL INPUT VOLTAGE (RANGE VDC)	OUTPUT VOLTAGE® (VDC)					
	2® VOLT	5 VOLT	12 VOLT	15 VOLT	24 VOLT	48 VOLT
300 volt (200-375)	VI-16Z 15A/30W	VI-160 15A/75W	VI-161 8.3A/100W	VI-162 6.7A/100W	VI-163 4.2A/100W	VI-164 2A/100W
150 volt (100-200)	VI-15Z 15A/30W	VI-150 15A/75W	VI-151 8.3A/100W	VI-152 6.7A/100W	VI-153 4.2A/100W	VI-154 2A/100W
48 volt (40-60)	VI-13Z 15A/30W	VI-130 15A/75W	VI-131 8.3A/100W	VI-132 6.7A/100W	VI-133 4.2A/100W	VI-134 2A/100W
36 volt ("wide mouth") (20-56)	VI-12Z 10A/20W	VI-120 10A/50W	VI-121 4.16A/50W	VI-122 3.33A/50W	VI-123 2A/50W	VI-124 1A/50W
24 volt (20-30)	VI-11Z 15A/30W	VI-110 15A/75W	VI-111 8.3A/100W	VI-112 6.7A/100W	VI-113 4.2A/100W	VI-114 2A/100W
12 volt (10-20)	VI-10Z 15A/30W	VI-100 10A/50W	VI-101 4.16A/50W	VI-102 3.33A/50W	VI-103 2A/50W	VI-104 1A/50W

BOOSTER OPERATION

Westcor VI-100 modules are regulated DC to DC converters; each is a self-contained power supply with internal regulation control circuitry. VIB-XY power boosters do not contain regulation control circuitry and must be used with a VI-100 series module of the same input and output voltage combination (e.g., VI-160 and VIB-60) in a master-slave arrangement. Boosters process one to two times the power of a matching VI-100 module and are simply paralleled by tying the "gate out" pin from the master to the "gate in" pin of the booster (slave). Any number of boosters may be paralleled by daisy chaining (see application note in data sheet). Current sharing between master and slave(s) is proportional to module output rating within 10% (e.g., a VI-160 and

VIB-60 operating in parallel at half load will process 7.5 and 12.5 amps, respectively).

Westcor Megahertz Power Boosters will be available in the near future for popular input and output voltage combinations (e.g., 300 input, 5 VDC at 30 amps output). Minimum order quantities may apply. Contact factory for details.

PRODUCT GRADES

Westcor offers VI-100-X converters and VIB-XY-X power boosters in three product grades: Commercial grade (no "dash number" or -C), Industrial (-I), and Military (-M). Modules are burned-in, tested, and guaranteed within each grade to specific levels, thereby providing a reliable product for a broad range of applications.

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PRODUCT GRADE SPECIFICATIONS

PARAMETER	PRODUCT GRADE		
	COMMERCIAL	INDUSTRIAL	MILITARY
Storage Temperature	-20° to 105°C	-40° to 105°C	-55° to 105°C
Operating Temperature (Base Plate)	0° to 85°C	-40° to 85°C	-55° to 85°C
Burn-In	48 hours	72 hours	120 hours
Temperature Cycled with power off	No	8 times between -40° to 105°C	8 times between -55° to 105°C
Test Data taken at these temperatures supplied with each unit	N/A	-40°, 25°, 85°C	-55°, 25°, 85°C
ATP Performed	Yes	Yes	Yes
ATP Data supplied with each unit	No	Yes	Yes
Warranty	2 year	3 year	5 year

VI-100 SERIES SPECIFICATIONS Electrical Characteristics ($T_C = 25^\circ\text{C}$, $V_{in} = V_{nom}$, $P_{out} = 2/3P_{max}$)

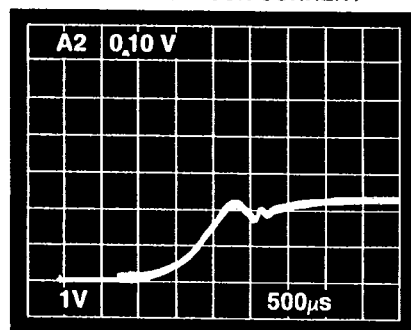
CHARACTERISTIC		SYMBOL	MIN	NOMINAL	MAX	UNIT	FIG.
INPUT CHARACTERISTICS							
1	Voltage range (operation over this range specified)	VR		see selector guide		V	1
2	In-rush current ($V_I = 0$ to LL or HL worst case, $V_O = FL$)	IRC					
3	In-rush charge ($V_I = HL$)	IRQ		0.5×10^{-4}	10^{-4}	Coul	1
4	Under voltage (no damage to unit or circuitry)	UV	0 to LL			N/A	
5	Input reflected ripple current (at full load, high line)	IRRC			10% I.I.	p-p	2
6	Input ripple rejection (120 Hz) [®]	IRR		$30 + 20 \log \left(\frac{V_{IN}}{V_{OUT}} \right)$		dB	
7	No load power dissipation	NLD			1.2	W	
8	Logic disabled power dissipation	LDP			1.2	W	7
9	Efficiency (75% of FL) all models [®]	Eff	79			%	
OUTPUT CHARACTERISTICS							
10	Set point accuracy	SPA		± 1	± 2	%	
11	Remote Sense Composition	RS			0.5V	V	
12	Adjustment range	AR	-25		+10 [®]	%	8
13	Load regulation (10 to 100%) (at the pins)	LoR		0.1	0.3	%	
14	Line regulation (Lo-Hi line)	LIR		0.05	0.2	%	
15	OVP set point (as a percentage of V_{out})	OVP	110	125	135	%	
16	Worst case error — including:	WCE			± 2	%	
17	line						
18	load						
19	noise (output)						
20	temperature (average from low to high rating)						
21	Differential Output Noise (DC to 20 MHz)	OnPP		0.5	1%	%	3
22	Current Limit (as a percent of IO FL, $V_O > 2V$)	CL	105	110	125	%	9
23	Short Circuit Limit (fold back point after $V_O < 0.2V$)	ScL		50		%	9
24	Output impedance (DC to 500 kHz)	OI		0.05		Ω	
ISOLATION CHARACTERISTICS							
25	Input to output isolation voltage (V_I 150, 160 series)	I/OV	3750			VAC	
26	Input to output isolation voltage (all others)		2000			VAC	
27	Input to output isolation capacitance	I/OC			50	pf	
28	Common-mode noise current (DC to 20 MHz)	CMNC			2	mA-p-p	
DYNAMIC CHARACTERISTICS							
29	Output transient response (10 to 100%, $V_O < 1\%$ s.s.)	OTR		100		μs	
30	Output transient response (50 to 100%, $V_O < 1\%$ s.s.)	OTR		100		μs	4
31	Line transient response (Lo-Hi Line) (V_O , 1% s.s.)	LTR		100		μs	5
32	Turn on time from power on ($V_O < 1\%$ s.s.)	ToTp		1		ms	6
33	Turn on time from logic enable ($V_O < 1\%$ s.s.)	ToT1		1		ms	

CHARACTERISTIC (cont.)		SYMBOL	MIN	NOMINAL	MAX	UNIT	FIG.
THERMAL CHARACTERISTICS							
34	Operating temperature range—BASEPLATE (Commercial)	OTbp	0		+85	C	
35	Storage temperature range (Commercial)	STbp	-20		+105	C	
36	Heat sink requirements to maintain 85°C B.P. at FL**	n/a			2.5	C/W	
37	Output temperature drift — average over temp. range	OTD		0.02		%/C	
ENVIRONMENTAL CONSIDERATIONS							
38	MTBF @ 80°C Baseplate (MIL-STD-217D)	MTBF		214,000		hrs	
39	MTBF @ 30°C Baseplate (Bell Standard)	MTBF		800,000		hrs	
40	Humidity-MIL-STD 810 method 507 procedure I			Option		N/A	
41	Acceleration-MIL-STD 810 method 513 procedure I, II			Option		N/A	
42	Vibration-MIL-STD 810 method 514 procedure I at 15G			Option		N/A	
43	Shock-MIL-STD 810 method 516 procedure I-IV at 44G			Option		N/A	
44	Fungus-MIL-STD 810 method 508.1 procedure I			Option		N/A	
45	Salt spray and fog-MIL-STD 810			Option		N/A	
46	Sand and Dust-MIL-STD 810 method 510.1 procedure I			Option		N/A	
47	Explosive atmosphere-MIL-STD 810 method 511.1 procedure I			Option		N/A	
MECHANICAL SPECIFICATIONS							
48	Volume				4.6	C.I.	
49	Weight				115	grams	
50	Exposed Materials-Chromated aluminum and epoxy					n/s	
51	Torque on hold down nuts		10		20	in/lb	

DEFINITIONS: VO = Output Voltage VI = Input Voltage IO = Output Current II = Input Current LL = Low Line HL = High Line ML = Minimum Load
 FL = Full Load s.s. = Steady State **25°C ambient

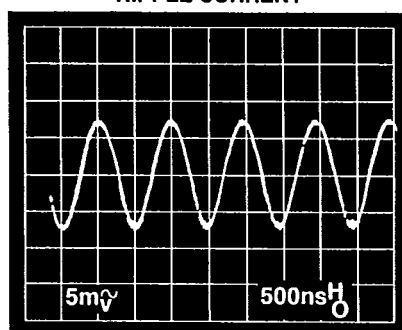
TYPICAL CHARACTERISTICS VI-130

FIG. 1 — IN RUSH CURRENT



1V = 1A

FIG. 2 — INPUT REFLECTED RIPPLE CURRENT



2 mA/mV

FIG. 3 — OUTPUT NOISE

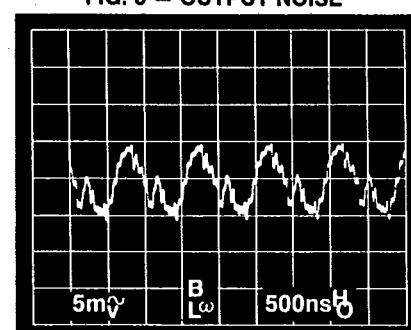
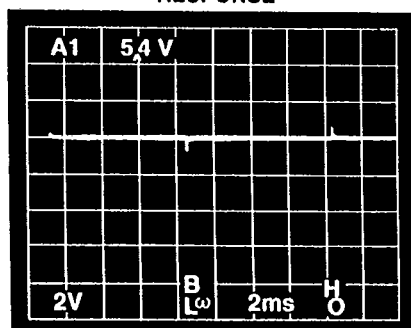
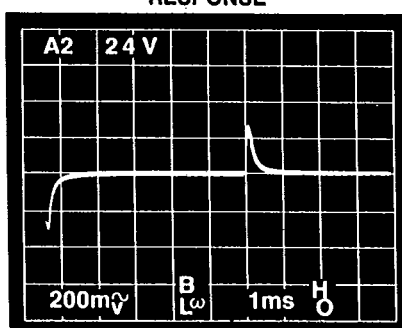


FIG. 4 — OUTPUT TRANSIENT RESPONSE



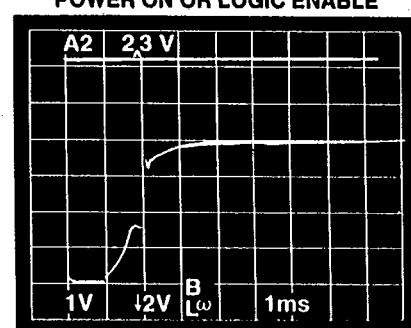
HALF LOAD TO FULL LOAD

FIG. 5 — LINE TRANSIENT RESPONSE



LOW LINE TO HIGH LINE

FIG. 6 — TURN-ON TIME POWER ON OR LOGIC ENABLE



AT FULL LOAD

FIG. 7 — LOGIC DISABLE APPLICATION CIRCUIT

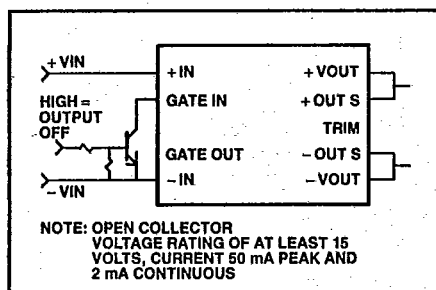


FIG. 8 — ADJUSTMENT PROCEDURE

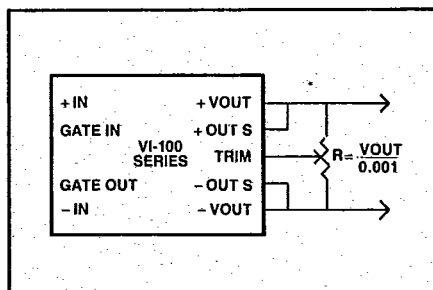
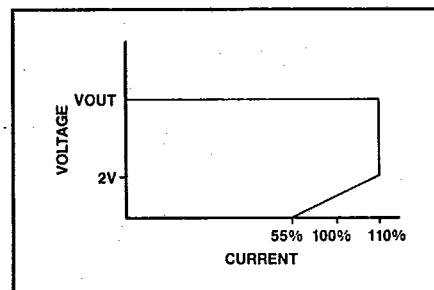


FIG. 9 — CURRENT/SHORT CIRCUIT CHARACTERISTICS



VI-100 SERIES OFF-LINE OPERATION

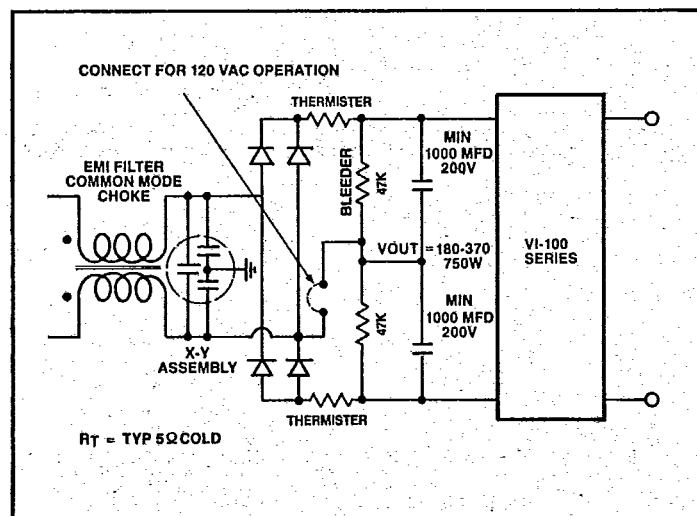
Westcor VI-150 and VI-160 series MHz converters were designed for use in off-line applications. The VI-150 series is used for Domestic, Japanese or any nominal 150 volt input applications. The VI-160 series will support applications worldwide. All VI-100 series were designed to support distributed power processing, with the regulator at or near the point of load and the AC front-end[®] in a protected environment away from sensitive circuitry.

If the VI-150 series is used, the line is simply rectified and stored in reservoir capacitors. If the VI-160 series is used, the

domestic line is doubled and stored in reservoir capacitors or the European line is simply rectified and stored in the same reservoir capacitors. In the case of the VI-160 series, a switch or a jumper can be included to simply rectify or double the line, depending on whether the input is 120 or 220 VAC (see application chart below).

VI 100's provide total flexibility when designing a power system, because the AC front end is not integral to the unit. Westcor products may be integrated directly into new distributed power systems, or with the addition of an AC front end into more traditional off-line applications.

TYPICAL APPLICATION CIRCUIT



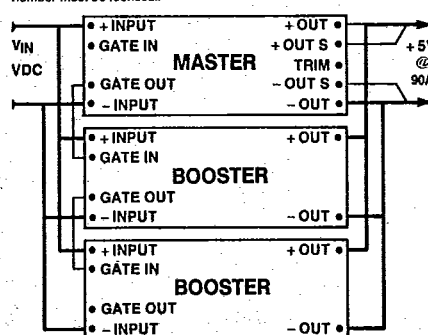
NOTES

- Consult factory for additional thermal information.
- 2 volt output is less than 80%.
- Consult factory for models already approved by UL, CSA and TUV (VDE).
- Some 24 and 48 VDC outputs higher; consult factory.
- Contact factory for availability. Minimum order quantities may apply.

POWER BOOSTER APPLICATION

USING THE WESTCOR POWER BOOSTER MODULES:

When specifying power booster modules, it is important to stress that the last two digits of each model number must be identical.



The use of the booster module is very straightforward:

- Parallel input and output pins.
- Tie the GATE OUT of the master to GATE IN of the first VIB-100 booster.
- If additional boosters are required, tie the GATE OUT of the booster to GATE IN of the next booster in line.
- Close the senses at the point of load.

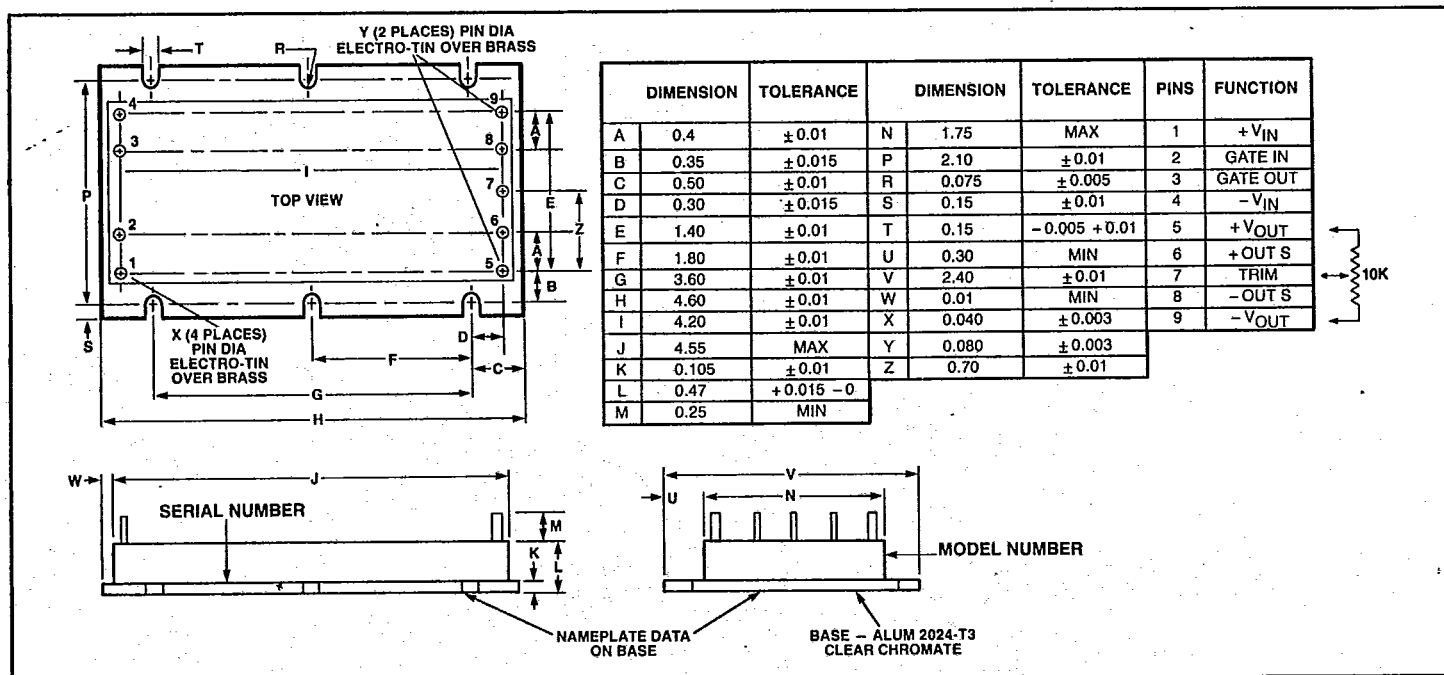
MECHANICAL

The mechanical dimensions for the VIB series boosters are the same as the VI-100 series converters that gate the boosters. The PIN OUT is identical with the exception of three pins — the two sense pins and the trim pin, which are not on the booster. Please refer to the VI-BXY data sheet for these dimensions.

- Factory set voltages between 2 and 48 volts are available. Contact factory. Minimum order quantities may apply.
- Request "front-end" design application notes from the factory for additional information.
- Maximum output adjustment is limited by factory set OVP (10% minimum); OVP is not user adjustable.

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MECHANICAL DIMENSIONS



2, 3, AND 5 YEAR LIMITED WARRANTY

Westcor products are guaranteed for a period of 2 years for Commercial (-C) product, 3 years for Industrial (-I) product, and 5 years for military (-M) product from the date of shipment, against defects in material or workmanship, when in normal use and service. This warranty does not extend to products subjected to misuse, accident or improper application or maintenance. Westcor shall not be liable for collateral or consequential damage. This warranty is extended to the original purchaser only. **EXCEPT FOR THE FOREGOING EXPRESS WARRANTY, WESTCOR MAKES NO WARRANTY, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.** Westcor will repair or replace the defective product in accordance with its own best judgement. For service under this warranty the buyer must contact the factory to obtain a RETURN AUTHORIZATION NUMBER and shipping instructions. Products returned without prior authorization will be returned to the buyer. The buyer will pay all charges incurred in returning the product to the factory. The factory will pay all reshipment charges, if the product was defective within the terms of this warranty.

ORDERING INFORMATION

Order Placement — Orders may be placed with your area representative, or directly with the factory. Orders can be telephoned or sent in by mail. If orders are telephoned in, please confirm the order in writing. No orders will be shipped from the factory without a confirming purchase order.

For Immediate Order Placement Call:**TWX: 910-240-2108****(408) 395-7050****FAX: (408) 395-1518**

When ordering, please specify the complete model number, ship to and bill to address, and preferred method of shipment. Unless otherwise specified, all orders will be shipped UPS. For faster deliveries, specify UPS BLUE, or AIR EXPRESS.

Prices — All prices are quoted F.O.B. manufacturer in U.S. dollars. Applicable federal, state and local taxes are extra. Prices are subject to change without notice.

Terms — Net 30 days subject to prior credit approval.

Representatives

CA Santa Clara (Sourcetronics)	• (408) 988-8801
CA Los Angeles (Power Partners)	(213) 215-0800
CA San Diego (Power Partners)	(619) 560-0099
CA Irvine (Power Partners)	(714) 261-9200
CA Santa Barbara (Power Partners)	(805) 682-8892
IL Schaumburg (Engineering Products Assoc.)	(312) 882-7640
IN Cicero (Engineering Products Assoc.)	(317) 984-5226
IA Coralville (Engineering Products Assoc.)	(319) 354-5344
MN Minneapolis (Engineering Products Assoc.)	(612) 835-9022
OR Beaverton (Core II Marketing)	(503) 641-0877
TX Dallas (Allied Components, Inc.)	(214) 238-0408
TX Hurst (Allied Components, Inc.)	(817) 589-0456
TX Austin (Allied Components, Inc.)	(512) 331-4494
WA Redmond (Core II Marketing)	(206) 885-4344
WA Spokane (Core II Marketing)	(509) 922-2971

International

CN N. Vancouver (Coda Research)	(604) 922-3651
France (Paris) AK Electronique	(33)45755353
West Germany (Frankfurt)	
Kraus Industrie Elektronik GmbH	(49)69590756

**WESTCOR****WESTCOR CORPORATION**

485-100 Alberto Way Los Gatos, CA 95032 (408) 395-7050

WESTCOR VI-200 Series Selector Guide

T-57-11

NOMINAL INPUT VOLTAGE	OUTPUT VOLTAGE					OUTPUT POWER
	5V	12V	15V	24V	48V	
270 Volt (200-400)	—	VI-261-CU	VI-262-CU	VI-263-CU	VI-264-CU	200W
	VI-260-CV	VI-261-CV	VI-262-CV	VI-263-CV	VI-264-CV	150W
	VI-260-CW	VI-261-CW	VI-262-CW	VI-263-CW	VI-264-CW	100W
	VI-260-CX	VI-261-CX	VI-262-CX	VI-263-CX	VI-264-CX	75W
	VI-260-CY	VI-261-CY	VI-262-CY	VI-263-CY	VI-264-CY	50W
135 Volt (100-200)	—	VI-251-CU	VI-252-CU	VI-253-CU	VI-254-CU	200W
	VI-250-CV	VI-251-CV	VI-252-CV	VI-253-CV	VI-254-CV	150W
	VI-250-CW	VI-251-CW	VI-252-CW	VI-253-CW	VI-254-CW	100W
	VI-250-CX	VI-251-CX	VI-252-CX	VI-253-CX	VI-254-CX	75W
	VI-250-CY	VI-251-CY	VI-252-CY	VI-253-CY	VI-254-CY	50W
75 Volt (50-100)	—	VI-241-CU	VI-242-CU	VI-243-CU	VI-244-CU	200W
	VI-240-CV	VI-241-CV	VI-242-CV	VI-243-CV	VI-244-CV	150W
	VI-240-CW	VI-241-CW	VI-242-CW	VI-243-CW	VI-244-CW	100W
	VI-240-CX	VI-241-CX	VI-242-CX	VI-243-CX	VI-244-CX	75W
	VI-240-CY	VI-241-CY	VI-242-CY	VI-243-CY	VI-244-CY	50W
48 Volt (42-60)	—	VI-231-CU	VI-232-CU	VI-233-CU	VI-234-CU	200W
	VI-230-CV	VI-231-CV	VI-232-CV	VI-233-CV	VI-234-CV	150W
	VI-230-CW	VI-231-CW	VI-232-CW	VI-233-CW	VI-234-CW	100W
	VI-230-CX	VI-231-CX	VI-232-CX	VI-233-CX	VI-234-CX	75W
	VI-230-CY	VI-231-CY	VI-232-CY	VI-233-CY	VI-234-CY	50W
36 Volt "Wide Mouth" (21-56)	—	—	—	—	—	200W
	—	—	—	—	—	150W
	VI-220-CW	VI-221-CW	VI-222-CW	VI-223-CW	VI-224-CW	100W
	VI-220-CX	VI-221-CX	VI-222-CX	VI-223-CX	VI-224-CX	75W
	VI-220-CY	VI-221-CY	VI-222-CY	VI-223-CY	VI-224-CY	50W
24 Volt (21-32)	—	—	—	—	—	200W
	VI-210-CV	VI-211-CV	VI-212-CV	VI-213-CV	VI-214-CV	150W
	VI-210-CW	VI-211-CW	VI-212-CW	VI-213-CW	VI-214-CW	100W
	VI-210-CX	VI-211-CX	VI-212-CX	VI-213-CX	VI-214-CX	75W
	VI-210-CY	VI-211-CY	VI-212-CY	VI-213-CY	VI-214-CY	50W
12 Volt (10-20)	—	—	—	—	—	200W
	—	—	—	—	—	150W
	—	—	—	—	—	100W
	VI-200-CX	VI-201-CX	VI-202-CX	VI-203-CX	VI-204-CX	75W
	VI-200-CY	VI-201-CY	VI-202-CY	VI-203-CY	VI-204-CY	50W

Please see notes on the reverse side.

NOTES:

- 1). Minimum input voltages for 75% of a module's rated output power are as follows:

MODEL	INPUT VOLTAGE VDC
VI-26X-XX	170
VI-25X-XX	85
VI-24X-XX	43
VI-23X-XX	36
VI-22X-XX	18
VI-21X-XX	18
VI-20X-XX	N/A

- 2). Transient high line conditions permitted as follows:

MODEL	INPUT VOLTAGE VDC	DURATION
VI-26X-XX	425	1 sec.
VI-25X-XX	212	1 sec.

- 3). -C in above model numbers indicate Commercial product grade. See reverse of this selector guide for -C, -I (Industrial) and -M (Military) product grade specifications.

- 4). All VI-200 Series products have the same package size: 2.4" x 4.6" x .5".

- 5). Special input voltages are available. Special factory set output voltages are also available, although it is recommended that the wide trimming range of the product (0-100% of nominal output voltage) be utilized using external trim resistors (doing this will decrease lead times and save the customer money). Minimum quantities will apply for special units. Contact factory.

PARAMETER	PRODUCT GRADE		
	COMMERCIAL	INDUSTRIAL	MILITARY
Storage Temperature	-20°C to 105°C	-40°C to 105°C	-55°C to 105°C
Operating Temperature (Base Plate)	0° to 85°C	-40° to 85°C	-55° to 85°C
Burn-In	48 hours	72 hours	120 hours
Temperature Cycled with power off	No	8 times between -40° to 85°C	8 times between -55° to 85°C
Test Data taken at these temperatures supplied with each unit	N/A	-40°, 25°, 85°C	-55°, 25°, 85°C
ATP Performed	Yes	Yes	Yes
ATP Data supplied with each unit	No	Yes	Yes
Warranty	2 Year	3 year	5 year