Overview

The IAM is a component-level, DC input front-end filter that when used in conjunction with the Vx-200 and Vx-J00 Family of DC-DC converters provides a highly efficient, high density power system with outputs from 1 – 95V_{DC} and power expansion from 25 – 800W.

There are five input attenuator modules available for the commercial market that comply with telecommunication and industrial control EMC specifications: Refer to data sheets for applicable standards at vicorpower.com.

Model	Input Voltage Range	Maximum Output Power [a] of Converter Combinations
VI-A11-xU	24V (21 – 32V)	200W
VI-AWW-xU	24V "W" (18 – 36V)	200W
VI-A33-xQ	48V (42 – 60V)	400W
VI-ANN-xQ	48V "N" (36 – 76V)	400W
VI-A66-xQ	300V (200 – 400V)	400W

Table 14.1 — *Output power capability*

[a] Based on DC-DC converters with 5V outputs or higher.

There are two input attenuator modules available for the defense market that comply with military EMC specifications, transient specifications and spike specifications. Refer to product data sheet for applicable standards at vicorpower.com.

Model	Input Voltage Range	Maximum Output Power of Converter Combinations
MI-A22-xU	28V (16 – 50V)	200W
MI-A66-xU	270V (125 – 400V)	200W

Table 14.2 — *Output power capability*

EMC

EMC performance is guaranteed when the IAM is used in conjunction with the recommended Vicor converters within the permissible power rating and in accordance with the recommended installation procedure. (Figure 14.3) The capacitor shown across the input of the converter and bypass capacitors shown on the –IN and +IN of the DC-DC converters to ground are required to meet EMC specifications. The capacitors should be Y-rated (interference suppression). Y capacitors have high voltage breakdown ratings to meet the isolation characteristics of the module's input to baseplate specification, self-healing properties, and safety agency approvals.

Input Reverse Polarity Protection

A Zener diode in the EMC filter provides reverse polarity protection when used with a properly rated fuse external to the IAM. The characteristics of the recommended input line fuses permit normal full load operation with protection in the event of a reverse polarity by clearing of the fuse. (Table 4.3).

Input Transient Protection

A Zener diode, inductor and capacitor in the EMC filter protect against short term transients. Transient voltages that persist beyond these limits are dropped across an N-channel enhancement FET, Q1. It is necessary that the FET be kept in saturation mode during normal operation. Thus it is necessary to connect the DC-DC converters' GATE OUT to the IAM's GATE OUT to charge pump the

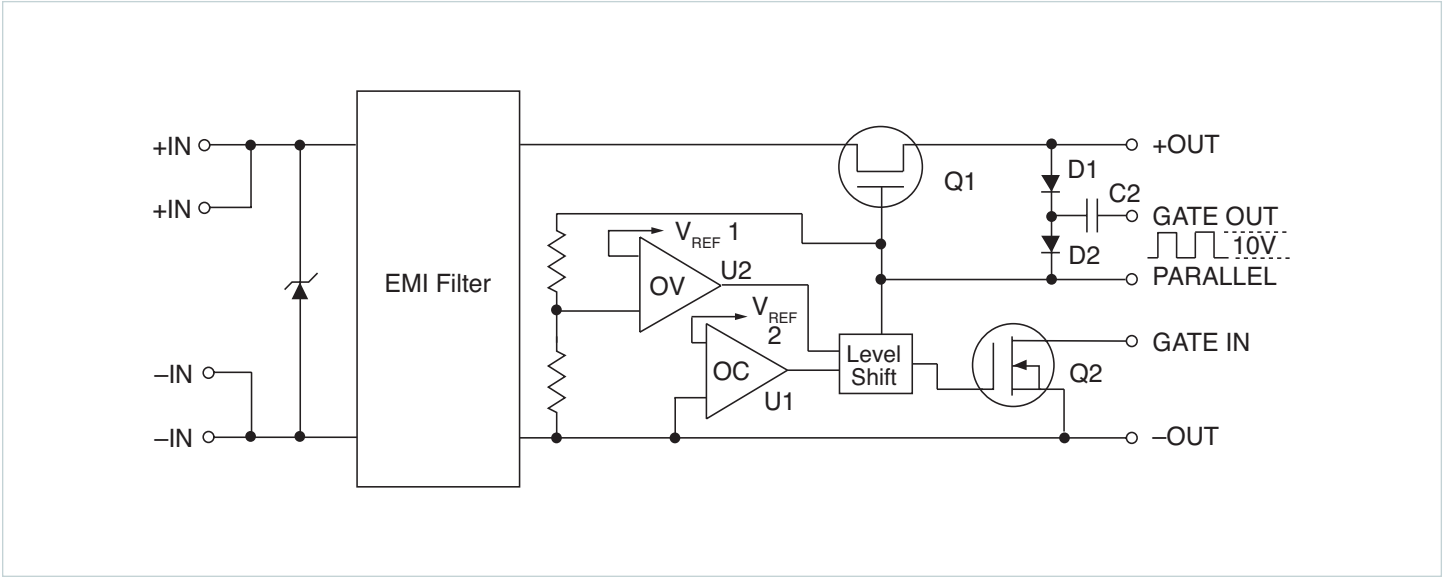


Figure 14.1 — *Block diagram of Input Attenuator Module (IAM)*

gate of the FET to a voltage in excess of its source. In the case where multiple DC-DC Driver modules are connected to one IAM, an external charge pump through the parallel pin (connected to the gate of the FET) must be added to ensure that the FET remains enhanced in the event GATE OUT enhancement is lost (Figure 14.4). The additional circuitry, C2, D1 and D2 are added externally to charge pump through the parallel pin.

Shut down of the DC-DC converters is accomplished by saturating Q2 during an input overvoltage to prevent possible damage to the converters. The IAM will automatically restart when the input overvoltage is reduced to within the input voltage range.

If the long term transient withstand specifications are exceeded, the recommended external fuse will clear.

Input Voltage	Recommended Fuse
24V	20A / 32V (AGC-20)
24V "W"	20A / 36V (AGC-20)
48V	20A / 60V (3AB-20)
48V "N"	20A / 80V (3AB-20)
300V	5A / 250V Bussman PC-Tron
28V	20A / 250V (3AB-20 or F03A, 125V, 20A)
270V	5A / 250V Bussman PC-Tron or F03A, 250V, 4A

Table 14.3 — *Recommended fusing based on input voltage*

Input Current

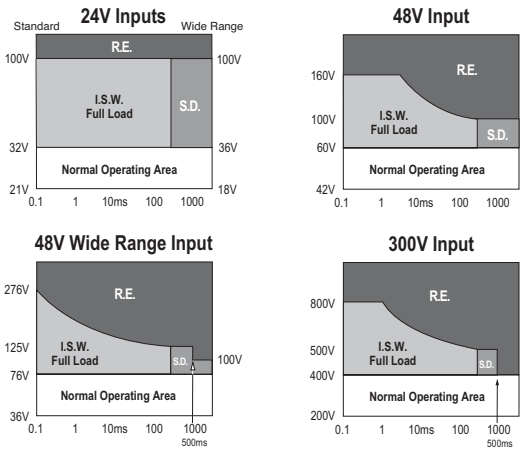
Inrush current is a function of the number of DC-DC converters that are connected to the input attenuator module (modules are not gated off at turn-on) and the amount of external capacitance added between the Input Attenuator Module and the DC-DC converter. The inrush current specification is 125% of steady state input current for 10ms. To avoid excessive dissipation in the element controlling the inrush (Q1), the following maximum values of external capacitance must be adhered to.

Input Voltage	Maximum Capacitance [a]
$24V_{DC}$ (21 – 32V)	470µF
$24V_{DC}$ (18 – 36V)	470µF
$28V_{DC}$ (18 – 50V)	390µF
$48V_{DC}$ (42 – 60V)	220µF
$48V_{DC}$ (36 – 76V)	120µF
$270V_{DC}$ (125 – 400V)	27µF
$300V_{DC}$ (200 – 400V)	27µF

Table 14.4 — *Recommended distributed capacitance on input of DC-DC converter(s)*

Safe Operating Area

(1% duty cycle max., Z_S = 0.5Ω, for short duration transient capability refer to specifications).



I.S.W.: Input surge withstand (no disruption of performance)
R.E.: Ratings exceeded
S.D.: Shut down

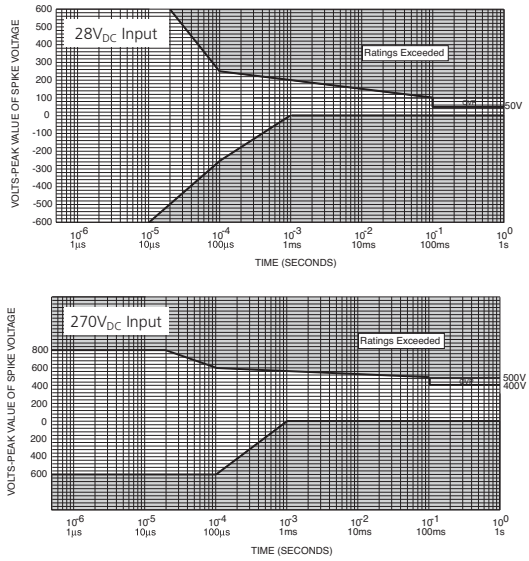


Figure 14.2 — *Output noise, with Ripple Attenuator Module (RAM)*

Output Overcurrent / Short Circuit Protection

Output overcurrent protection is a foldback type, followed by a timed latched shut down should the overcurrent persist beyond 2ms. If the overcurrent condition is removed before the timeout interval, auto restart shall occur. Should latched shut down occur, input power must be recycled to restart.

Output Overcurrent Threshold	
$24V_{IN}$ "W," $28V_{IN}$, $48V_{IN}$ "N"	20A
$24V_{IN}$, $48V_{IN}$	15A
$270V_{IN}$, $300V_{IN}$	4A

Table 14.5 — *IAM overcurrent*

Expansion Capabilities

The Input Attenuator Module incorporates a parallel pin permitting power expansion as long as the total output power from the DC-DC converters does not exceed the power rating of each Input Attenuator Module (EMC specifications are guaranteed for up to two input attenuators in parallel). It is necessary to include a 100Ω, 1/4W resistor between the negative outputs of the Input Attenuator Modules to ensure equal potential at these points when paralleling Input Attenuator Modules, so as not to impact the effectiveness of the internal common-mode choke.

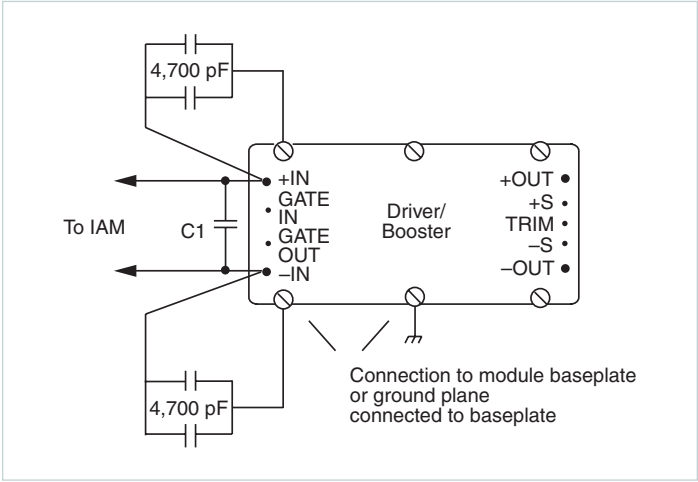
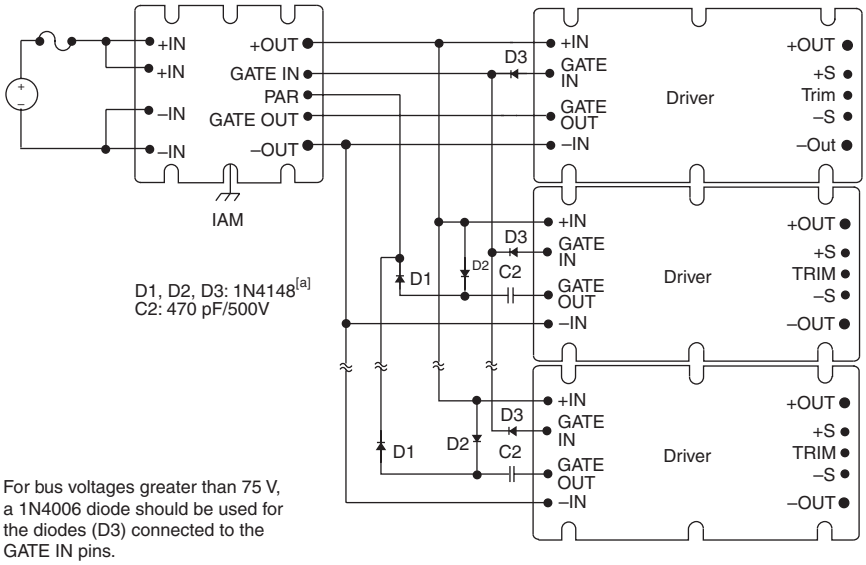


Figure 14.3 — *External x, y capacitors for EMC requirements*



Note: x, y capacitors not shown for clarity

Figure 14.4 — *IAM multiple-driver interconnection*

Safety Considerations

Shock Hazard. Agency compliance requires that the baseplate be grounded or made inaccessible

Fusing. Safety agency conditions of acceptability require module input fusing. See Table 14.3 for recommended fuse ratings.

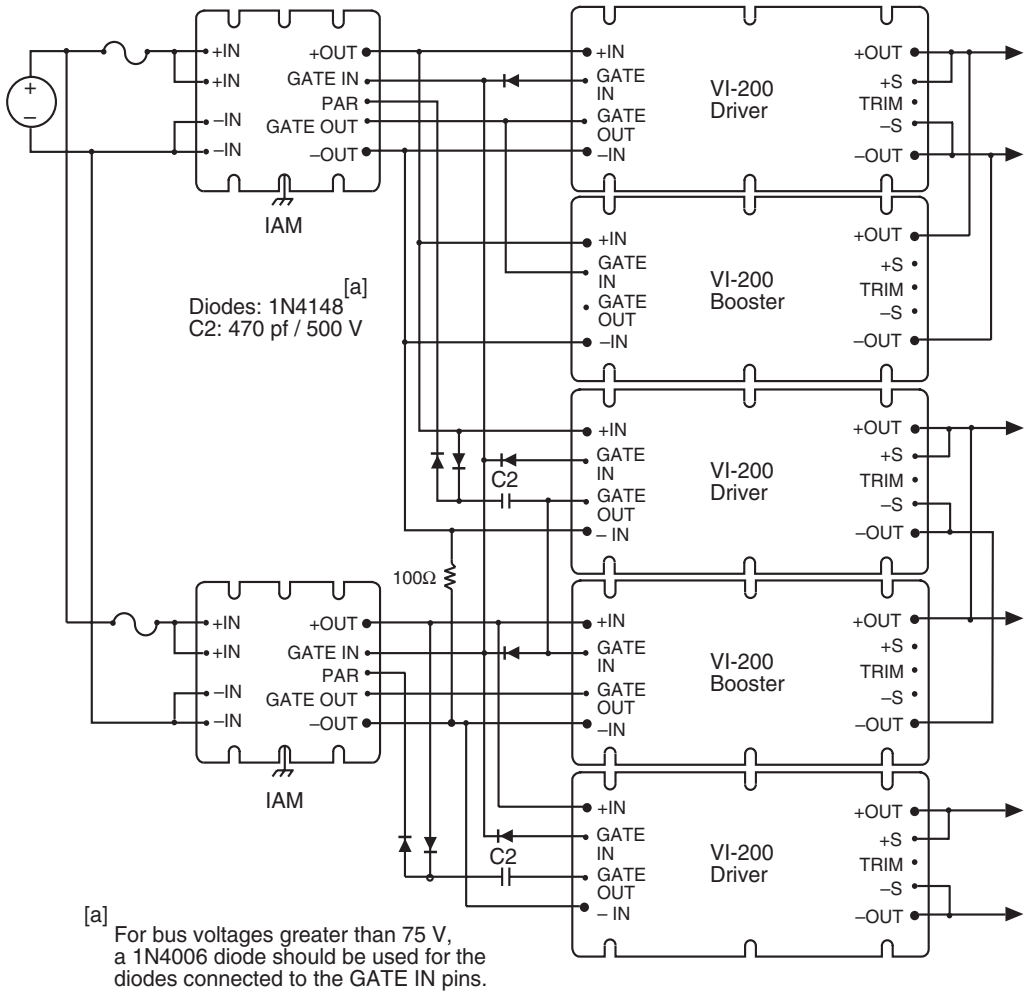


Figure 14.5 — *Paralleling connections for the IAM*