COUTANT LAMBDA

SPECIFICATION 67799
Date 1st July 1999

C E L D

AUTHORISED BY

OMEGA APPLICATION NOTE NUMBER 3b
USING OMEGA OPTIONS

TOPICS: List of options
W option (auto-ranging line selection)
X option (power supply inhibit and power fail)
Y5 option (paralleling output modules)
Y6, Y7, Y8 (module power good, inhibit and enable)

ISSUE	DATE	SIGNATURE	ECN
02	20.08.91	A. RAWICZ & K. BISHOP	
03	11.11.91	K. BISHOP	RELEASE
04	18.11.92	K. BISHOP	0784A
05	05.08.93	K. BISHOP	1185A
06	20.10.93	C. MELLOR	1334A
07	02.11.93	C. MELLOR	1502A
08	25.11.93	C. MELLOR	1574A
09	21.02.94	C. MELLOR	1609A 1659A
09	24.08.94	K. BISHOP	REPRINT
10	17.05.95	K. BISHOP	2735A, 2722A, 2671A, 2733A
11	26.01.96	K. BISHOP	3025A
12	28.05 96	K. BISHOP	4218A/4148A/4147A
13	21.10.97	K. BISHOP	8212A
14	16.3.98	K. BISHOP	11268A
15	16.06.98	K. BISHOP	8392A
16	30.6.99	K. BISHOP	15346A

K. Bishop 6-7-99

Issued to: .....

At: .....

Options

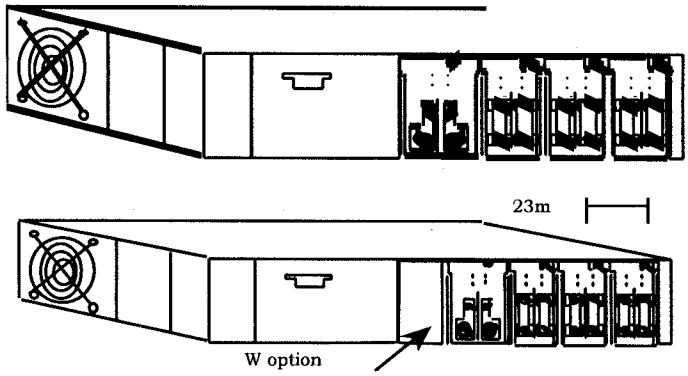
The flexibility of Omega is further enhanced by the range of options available. "Primary options" provide signals related to the "primary" (mains input) side of the power supply. "Secondary options" provide signals and functions related to the "secondary" (output side) of the power supply.

Any combination of options may be specified but a converter may only have one "X" option and an output module only one "Y" option. Therefore a converter cannot have both "X" and "UX" options nor a module both "Y5" and "Y6" options. Thus some combinations (e.g. parallel redundancy with module inhibit) are not available. Only single output modules may have options: twin modules are not available with options.

Option		Type	Description
W	Primary	Auto-ranging line selection (Omega 200 and 400 only)	
... X	Primary	Side-connecting option for "Power Fail" and "Power Supply Inhibit" signals	
... UX	Primary	End-connecting option for "Power Fail" and "Power Supply Inhibit" signals.	
	Y 1-4	Secondary	Obsolete Output Options
	Y5	Secondary	"Starpoint" Paralleling and "Module Good" signal for parallel redundant applications.
	Y6	Secondary	"Power Good" and "Inhibit": (active high and low).
	Y7	Secondary	"Power Good" and Enable (active high).
	Y8	Secondary	"Power Good" and Enable (active low).

"W" Option - Autoranging Line Selection.

The option is a 23mm (single slot) module for Omega 200 and 400 power supplies which is fitted between the converter and output modules. Side connecting Omega power supplies (see "X" option below) fitted with the "W" option are therefore 23mm longer than the same configuration without a "W" option. End connecting power-supply configurations of more than 4 slots cannot be fitted with an "W" option.

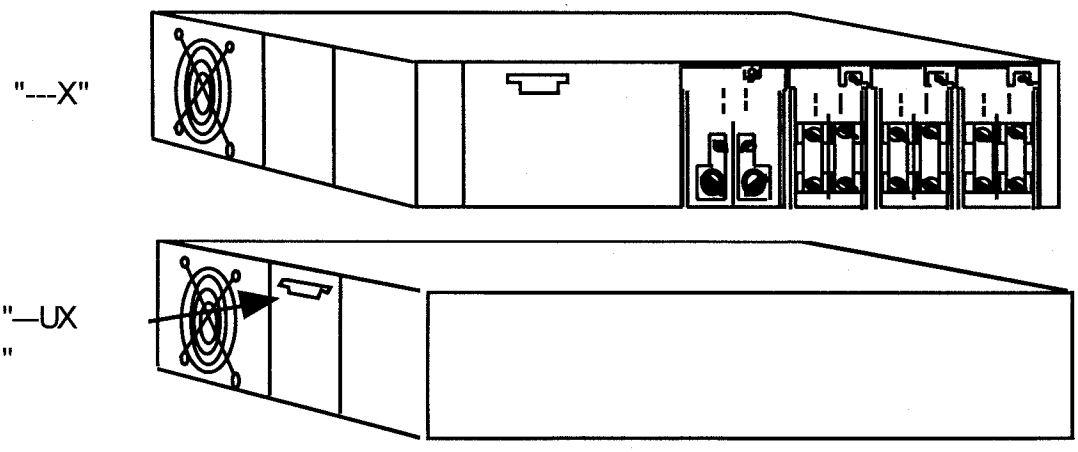


The "W" option module contains circuitry to sense the line voltage. When the line voltage is 110V (90-132Vac), the module energizes a triac to short-circuit the low voltage selection link of the converter, putting the converter into "voltage - doubling" mode. When the line voltage is 230V (180 - 264Vac), the triac remains de-energized and the converter selection open-circuit placing the converter in"non-voltage-doubling" mode.

The "W" option is internally wired into the Omega Power supply. The user only connects the live, neutral and earth wire. The 110 volt selection link terminals must not be connected.

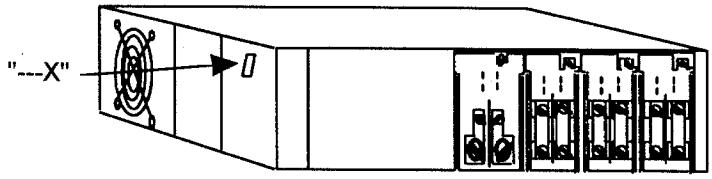
"X" Option - "Power Fail" and "Power Supply Inhibit" signals

The option is a small card built into the converter with a male output socket for access to the signals. "X" option cards are specific to the converter type and are designated "...X" where "..." refers to the converter type (e.g. "200 X" for the Omega 200, "400 X " for the Omega 400 and so on). In addition, some converters allow both side and end connecting options where the designation "...X" is for side connecting and "...UX" is for end connecting.

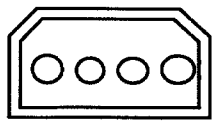


Converter	"X" options available
200 watts	200X only
400 watts	400X, 400UX

The Omega 600 has the "X" option fitted as standard and accessible from the front by the mains input connector.



The connection to the "X" option is made via a Molex connector, pin number as shown:
Connector Pin Dedications (Molex 4-way header type: 5268 - 4A):



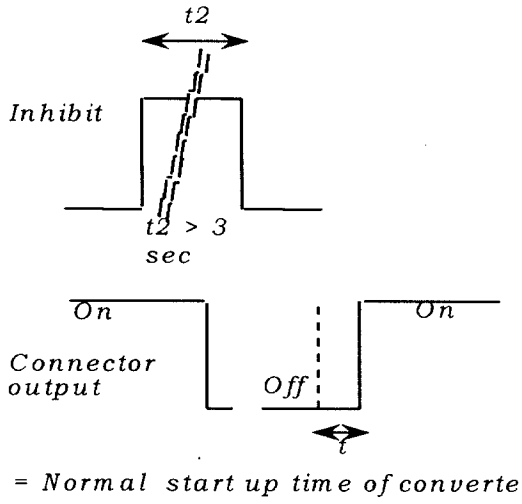
Pin No. 4 3 2 1

Inhibit Option:
Opto-isolated photo diode requiring specified current to inhibit the entire Omega.

If a pulse of >3sec in width is applied the omega will be inhibited until the pulse is removed.

The response time of the converter is that it stops within typically 30mSec of the application of the pulse and will restart within typically 700mSec of removal of the pulse.

Inhibit Pulse Diagram.



Note. Pulse inhibit operation not applicable to 400PFC converter.

Power Fail Signal

Opto isolated NPN transistor which is "on" when the mains power is good and open-circuit when the mains fails. The transition to the open circuit state precedes the power supply output going out of regulation by typically 5m Secs.

On power-up this output will not switch to the "good", i.e. "on" state until the converter output has reached the specified level.

Application of a power supply inhibit pulse will result in a "power fail" condition being indicated.

This signal is also used to indicate that thermal shut-down of the converter has occurred.

200 Watt "X" option specification

Signal	Pin Number	Description
Power supply inhibit -	1	Opto isolated diode anode
Power supply inhibit+	2	Opto isolated diode cathode via internal resistor
Power Fail+	3	Opto isolated NPN transistor collector
Power Fail-	4	Opto isolated NPN transistor emitter

Specifications

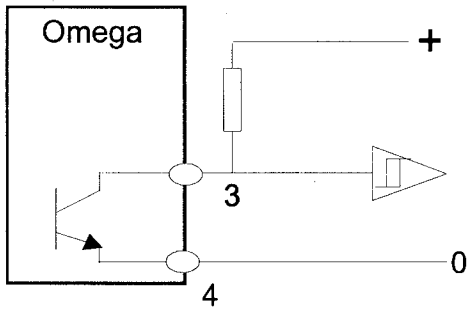
Inhibit	Min voltage	4.5 volts
	Max voltage	7.0 volts
	Current range	7.5 ‹ 15mA
	Max reverse voltage	5 volts
	Isolation from earth	>500Vdc
	Isolation from line	>4.7KVdc
	Mains interrupt time	>5 secs

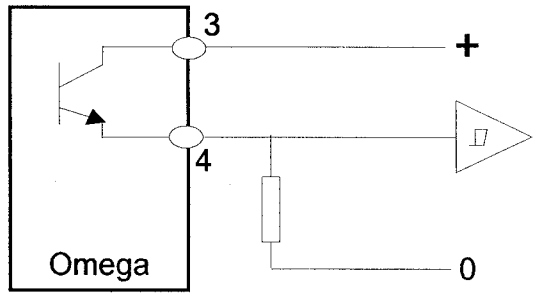
Noise greater voltages can be applied provided an external resistor is used to keep the current input within the current range.

Power Fail	Max collector emitter voltage	60V
	Max current for Vce	= 1.5V = 5mA
	Min forward current	= 5mA
	Max reverse current	= 45mA
	Isolation from earth	>500Vdc
	Isolation from line	>4.7KVdc

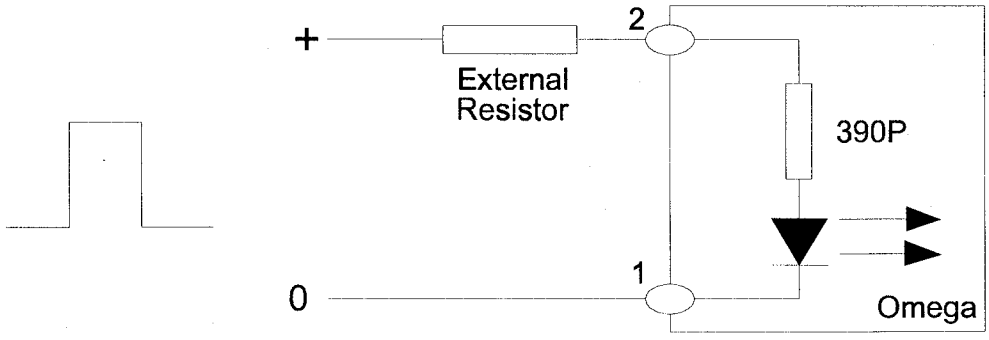
Note: Reverse voltages clamped by a diode as rated.

Typical interface circuits for power fail:





Typical Interface circuit for Power Supply Inhibit:



400 Watt "X" option specification

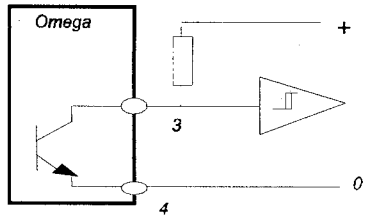
Signal	Pin Number	Description
Power supply inhibit -	1	Opto isolated diode anode
Power supply inhibit+	2	Opto isolated diode cathode via internal resistor
Power Fail +	3	Opto isolated NPN transistor collector
Power Fail-	4	Opto isolated NPN transistor emitter

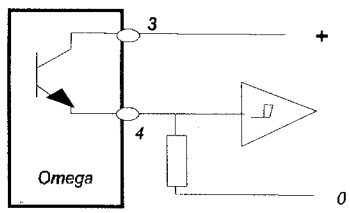
Specifications

Inhibit	Min voltage	4.5 volts
	Max voltage	7.0 volts
	Current range	7.5 ‹ 15mA
	Max reverse voltage	5 volts
	Isolation from earth	>500Vdc
	Isolation from line	>4.7KVdc
	Mains interrupt time	>5 secs
	Noise greater voltages can be applied provided an external resistor is used to keep the current input within the current range.	
Power fail	Max collector emitter voltage	60V
	Max current for Vce	= 1.5V = 5mA
	Min forward current	= 5mA
	Max reverse current	= 45mA
	Isolation from earth	>500Vdc
	Isolation from line	>4.7KVdc

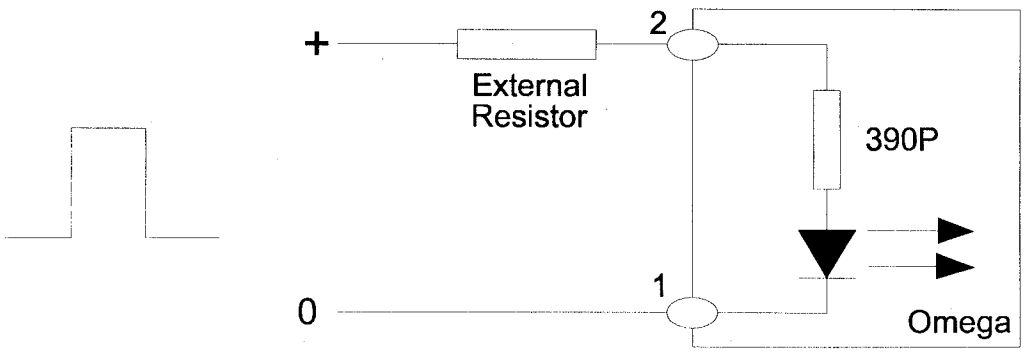
Note: Reverse voltages clamped by a diode as rated.

Typical interface circuits for power fail:





Typical Interface circuit for Power Supply Inhibit:



400PFC "X" option specification

Two styles of "X" options are available, "X1" or "X2".

"X1" option provides compatibility with standard 400W converter, see 400W "X" option specification. "X1" does not however support pulse inhibit mode (see page 4).

"X2" option provides TTL compatible signals for "Power Fail" and "Inhibit". These signals share a common 5 volt auxiliary supply and external power is <u>not</u> required for "Inhibit" control.

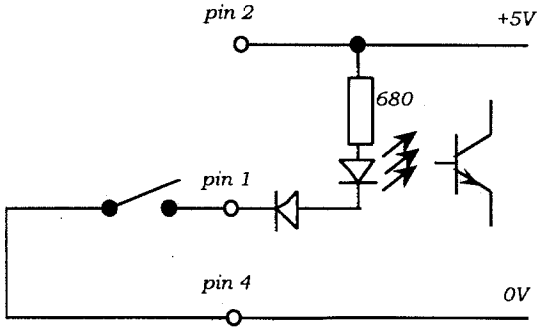
Pin Number	***Signal (X2)***
1	*Inhibit (active low)*
2	*5V auxiliary output*
3	*Power fail (high on fail)*
4	*0V auxiliary output*

Specifications (X2)

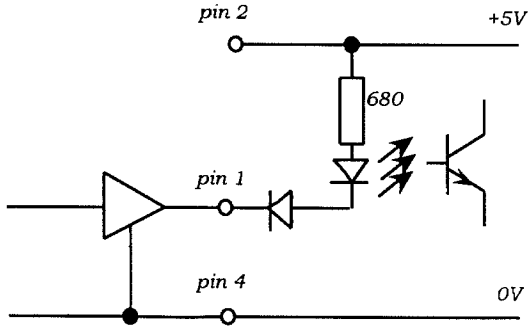
Inhibit	*Low level input voltage, VIL*	*= 0.4V max*
	Low level input current, IIL	*= 6mA max*
	Max inhibit pin voltage	*= 60V*
	Response time (high-low)	*= 500µS max*
	Response time (low-high)	*= 700mS max*
	Isolation to earth	*= 500Vdc max*
	Isolation to Line	*= 4.7KVdc max*
Power fail	*Low level output voltage, VOL*	*= 0.4V max (IOL = 16mA)*
	Max output sink current	*= 50mA*
	Max supply voltage	*= 38V*
	Max reverse clamp current	*= 50mA*
	Isolation from earth	*= 500Vdc max*
	Isolation from line	*= 4.7KVdc max*
Auxiliary Supply	*Output voltage pin 2 - pin 4*	*= 5V ±5%*
	Max output current	*= 50mA*
	Protection	*= Over-load and short circuit protected*

Typical Application Circuits

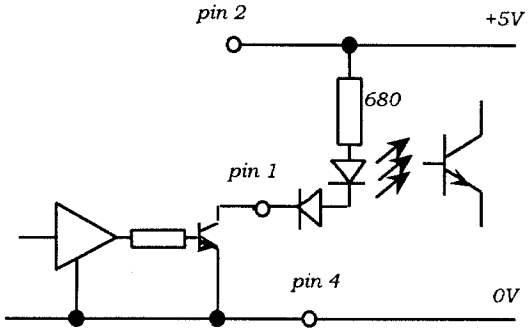
Inhibit



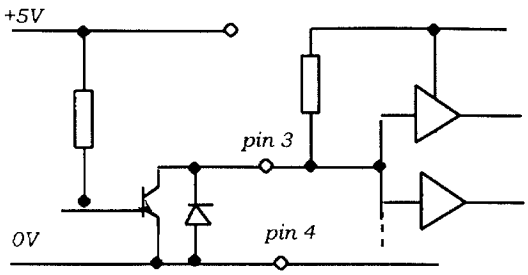
a. Inhibit via switch or relay contacts.



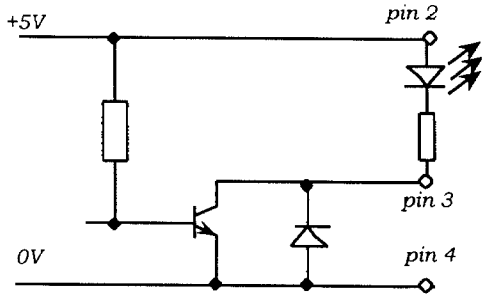
b. Inhibit via open collector TTL gate



c. Inhibit via CMOS gate.



a. Power fail driving TTL/ CMOS gate(s) (add external pull up resistor)



b. Simple Power fail indication

Power Fail

600 Watt "X" option specification

Signal	Pin Number	Description
Power supply inhibit -	1	Opto isolated diode anode
Power supply inhibit+	2	Opto isolated diode cathode via internal resistor
Mains fail +	3	Opto isolated NPN transistor collector
Mains fail -	4	Opto isolated NPN transistor emitter

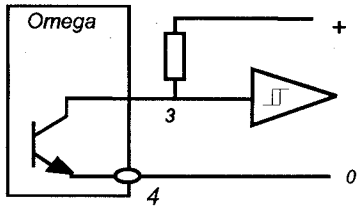
Specifications

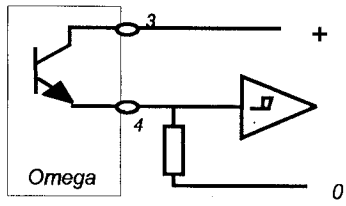
Inhibit	Min voltage	4.5 volts
	Max voltage	27.0 volts
	Current range	6.0 ‹ 68mA
	Max reverse voltage	5 volts
	Isolation from earth	>500Vdc
	Isolation from line	>4.7KVdc
	Mains interrupt time	>1 minute

Noise greater voltages can be applied provided an external resistor is used to keep the current input within the current range.

Mains fail	Max collector emitter voltage	60V
	Max current for Vce	= 1.5V = 5mA
	Min forward current	= 5mA
	Max reverse current	= 45mA
	Isolation from earth	>500Vdc
	Isolation from line	>4.7KVdc

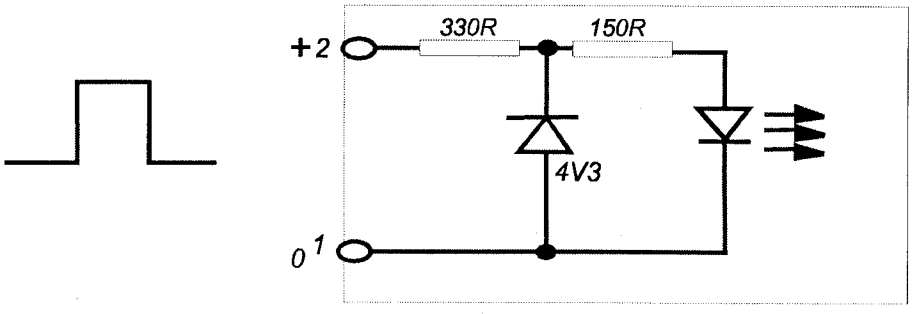
Note: Reverse voltages clamped by a diode as rated.





Typical interface circuits for power fail:

Typical Interface circuit for Power Supply Inhibit:



MML 800 PFC Customer Signals
The MML800 PFC customer signals provided are TTL compatible active low for "power fail" and "Inhibit". These signals share a common 5 volt auxiliary supply and external power is <u>not</u> required.

Pin Number	*Signal*
1	*Inhibit (active low)*
2	*5V auxiliary output*
3	*Powerfail (active low)*
4	*0V auxiliary output*

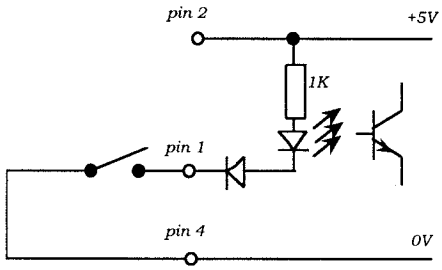
Specifications

Inhibit	*Low level input voltage, VIL*	*= 0.8V*
	Low level input current, IIL	*= 5mA max*
	Max inhibit pin voltage	*= 60V*
	Isolation to earth	*>500Vdc*
	Isolation to Line	*>4.7KVdc*
	Pulse operation	*4 - 7mS pulse width, Inhibit will latch*
		>150mS pulse width will unlatch inhibit.
		>150mS pulses should be applied for unlatching inhibit.
Power fail	*Low level output voltage, VOL*	*= 0.4V (IOL = 20mA)*
	Max output sink current	*= 60mA*
	Max supply voltage	*= 60V*
	Isolation from earth	*>500Vdc*
	Isolation from line	*>4.7KVdc*

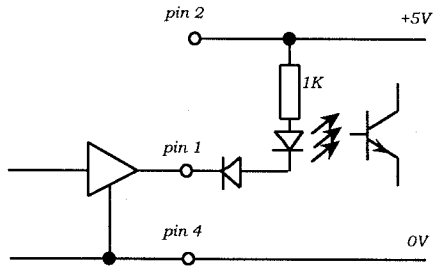
Note: Fit external diode for reverse voltage protection on mains fail.

Auxiliary Supply	*Output voltage pin 2 - pin 4*	*= 5V ±5%*
	Max output current	*= 50mA*
	Protection	*= Over-load and short circuit protected*

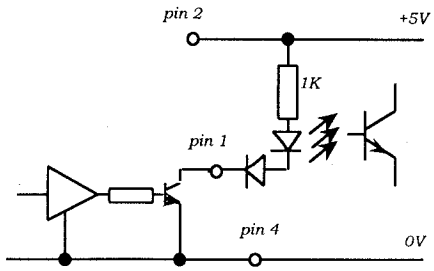
Typical application circuit inhibit



a. Inhibit via switch or relay contacts.



b. Inhibit via open collector TTL gate



c. Inhibit via CMOS gate.

Mains Fail

Y5 OPTION -'STARPOINT'PARALLELING WITH 'MODULE GOOD', SIGNAL

The ' Y5 ' option provides the signals to parallel OMEGA output modules , for either increase of output current or with appropriate external circuitry ' N+ 1 ' redundancy The option can only be used on similar modules set at the same voltage .
The option also provides a signal to indicate the condition of the output voltage.

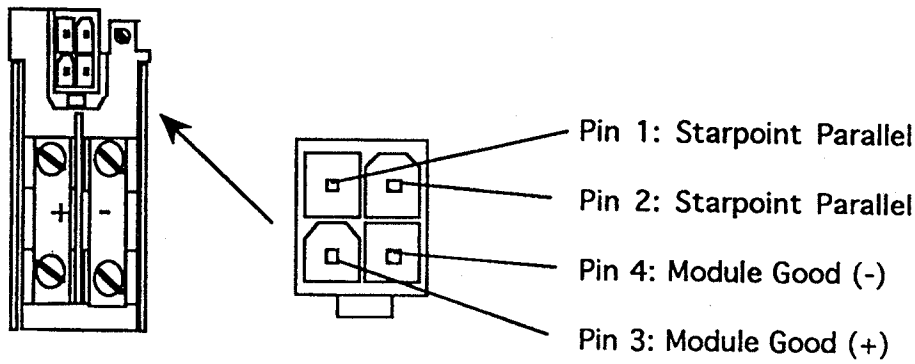
The ' Y5 ' circuits monitor the output current of the module to which it is fitted, and then by comparing this signal via the ' starpoint connection ' controls the output voltage of the module which is supplying less current and increases its voltage so that both modules supply approximately the same current . The output voltage of the module can be increased by the designed capture range of the module . This range varies for the four different module voltage ranges as below :-

A , B , L, Modules	2 - 6 volts	260 mV Capture range
C , F. Modules	5 - 15 volts	360 mV Capture range
D G Modules	12 - 28 volts	750 mV Capture range
J Module	25 - 60 volts	3.5 volts Capture range

The power good signal is set to monitor the output voltage and gives an indication that the output is above 91% of the set voltage , it also indicates that the ' starpoint' control is operating correctly , a failure indication occurs when the ' starpoint ' control exceeds 75% of the Capture range -

The option is provided by means of a small additional card which plugs into the module and is factory set to the specified voltage when ordered. Access to the signals is by means of a Molex connector at the top of the module front panel.
(Option socket Molex type 5569 - NAI , Suggested plug Molex type 5557 - NR Coutant Molex plug kit Part No. 89334.)

Connection Diagram. and SI2ecification



PINS I and 2	Starpoint Parallel	Pins internally connected. Connect to other module option card - can be daisy chained when more than two modules in parallel.
PIN 3	Module Good:	Collector of opto - isolated NPN transistor. which is on when module 'good'.
PIN 4	Module Good	Emitter of the above opto - isolated transistor

Specification of OPTO -ISOLATED Transistor

Maximum current:	5 mA at Vce = 1.5V
Typically :	1 mA at Vce = 0.5V
Max . collector - emitter voltage	80 Volts
Isolation from PSU output	500 Volts

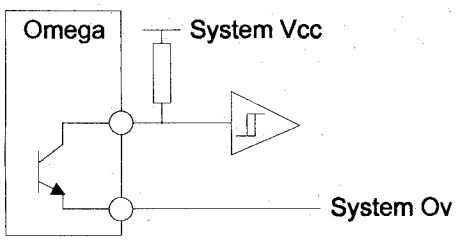
Note

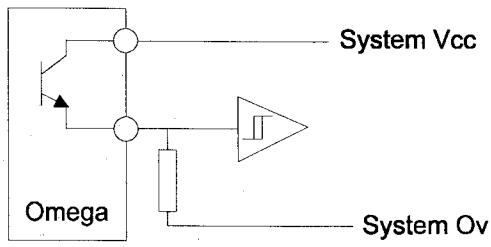
There are four versions of the Y5 option card, one for each Module output voltage range. The correct version will automatically be supplied with configured Omega power supplies. For field retrofits , care must be taken to ensure the correct voltage range and Y5 issue is fitted - contact Coutant Service Department .

MODULE GOOD TYPICAL INTERFACE CONNECTIONS

The OPTO - ISOLATED signal is on once the output voltage has risen above 91% of the set output voltage on the module (There is no upper limit - i.e. window detector as in the Y6-Y7-Y8 Option). This is factory set and cannot be externally adjusted. The value takes into account for sense wire voltage drops.

Typical Interface Circuit for Module Good.

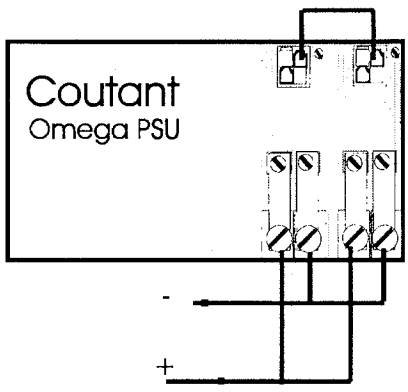




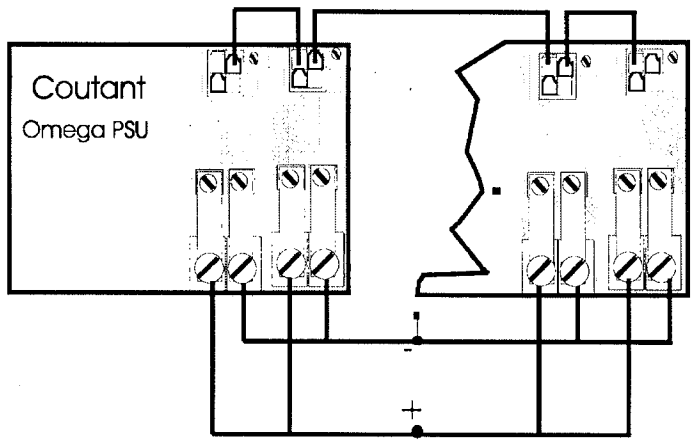
PARALLEL OPERATION OF POWER SUPPLIES

The Y5 can be used to increase output current of a system using more than one output module or in a N + 1 Redundancy system.

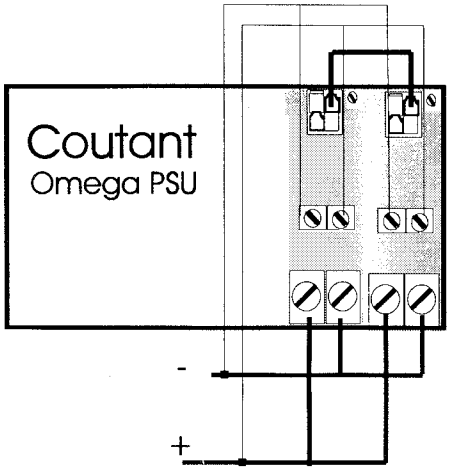
CIRCUIT DIAGRAM TO INCREASE OUTPUT CURRENT



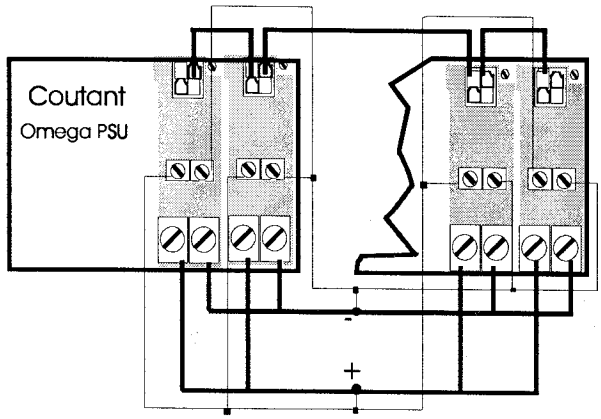
BETWEEN TWO MODULES IN SAME CONVERTER



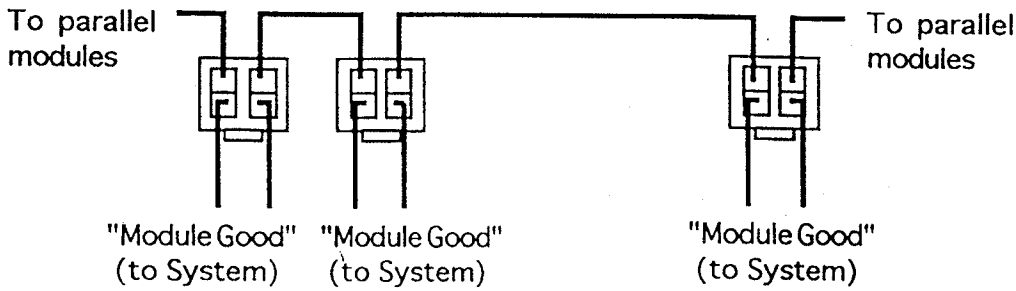
BETWEEN MODULES IN DIFFERENT CONVERTERS.



With remote sense



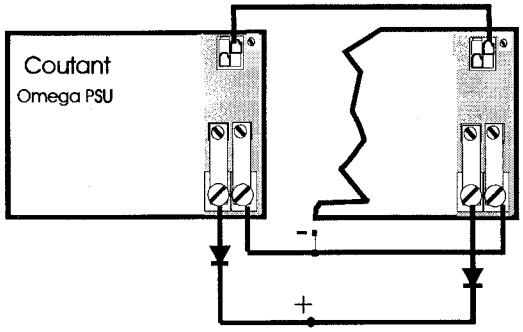
CIRCUIT DIAGRAM OF THE MOLEX CONNECTIONS



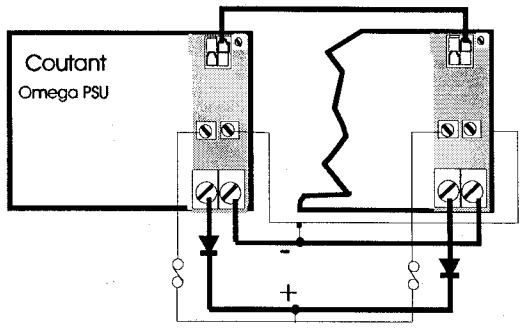
NOTE: -

The Y5 power good indication is totally isolated from the OMEGA voltage outputs thus these can be wired in series to create an indication if any one fails , or if monitored individually will indicate which module has gone faulty . (Isolation to earth is 500 V DC)

CIRCUIT DIAGRAM FOR **N + 1** REDUNDANCY



WITH LOCAL SENSE



WITH REMOTE SENSE

NOTES

1, The accuracy of the current sharing between the modules will be 10% . This value will depend on the following points. Note that the return of the starpoint data is the negative sense lead.

a, Ensure the same voltage drop in all the power wiring to the common load point . This ensures the starpoint data does not have a voltage offset on the starpoint line

b, The output voltage setting of the modules must be set closely to ensure the capture range is not exceeded . A typical value to set the voltages apart is to within + / - 50 mV of the nominal output voltage. Measured on the sense terminals at 50% load, with modules disconnected from each other. The resultant voltage is of the highest set voltage module in parallel.

C, The starpoint connection is used as close as possible to the negative sense lead i.e. twisted in the sense leads - or if in local sense laid close to the negative power leads . This is to reduce noise pick up in the starpoint wiring loop. If the load is placed distant, wire the starpoint lead directly between the power supplies and put ferrite beads on the star point wire close to the modules - to reduce noise pick up .

d, If using remote sense , ensure that the total voltage drop down the power leads does not exceed the 0.5V limits for remote sense.

e, Correct sharing will start to operate with a minimum load of 15% of the total output power that the parallel modules can supply.

f, The sharing accuracy of two Y5 's is typically +/- 6% . Thus total available power for two modules with Y5's will be greater than 90%. For more than two modules in parallel using Y5's , contact Technical Sales.

2, For N + 1 Redundancy isolating diodes must be fitted. The following points should be considered in the design of a system .

a, The voltage drop caused by these diodes must be taken into account as Note 1 d. The use of the extra low voltage drop diodes (Schottky type) which are now becoming available for parallel redundant applications is recommended.

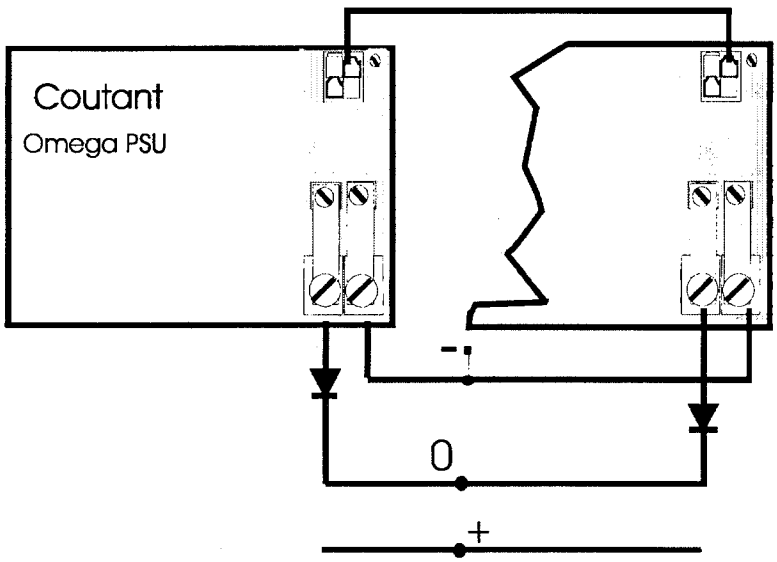
b, For complete isolation of the two supplies , the outputs should be wired in local sense.

c, If remote sense is required, to take into account of the diode voltage drop then these sense wires could be fused with 100 mA in line fuses which will give protection in the event of a fault on the sense wires causing a total fault on the remote sense wires of the other units .

d, For modules connected in parallel to supply negative voltage rails , it is VERY IMPORTANT, see next page, to connect the isolating diode to the POSITIVE OUTPUT of the module. This ensures correct referencing between the starpoint parallel circuits . If this is not done redundancy will not work - failures may also occur.

e, The voltage adjustment of the total system is NOT RECOMMENDED unless each individual power supply is removed and set up as in Note 1 b . Not doing this could cause the power fail indication to operate showing a failure due to the capture range exceeding its limit.

Circuit for negative outputs in parallel



3, For correct operation of the module good indication ensure that a 10% minimum load is connected to the system.

4, Modules can be connected in parallel with modules in the same power supply or with modules in other OMEGA power supplies.

HOTSWAP

The Y5 option allows OMEGA power supplies to be used in parallel HOT SWAP " , applications where one of a set of parallel connected power supplies can be removed without powering down the system.
The only constraint is that the hot swap operation needs to be sequenced such that parallel connections are made to the output terminals of the system either exactly coincidentally or in the following order, as the system is connected.

Power terminals first
Remote sense terminals second.
Starpoint parallel signals third .

The power supply that is being inserted can be either powered up or not powered up prior to connection. The isolation diodes will prevent any transients on the supply due to charging the output capacitors of the unpowered supply .

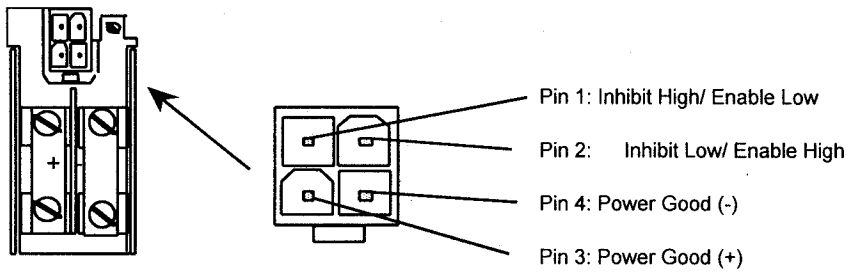
The supply being plugged in may cause a slight audible " hissing " sound until it is powered up . The sharing circuits may take up to 200 msec to stabilise .

Y6, Y7, Y8 options - "Power Good", Module Inhibit and Enable Signals.
The Y6 - 8 options (available only on single output modules) provide the signals to inhibit or enable modules for together with a "power good" signal.

Y6:	Pin 1:	Inhibit active high	Pin 2:	Inhibit active low
Y7:	Pin 1:	Do not connect	Pin 2:	Enable active high
Y8:	Pin 1:	Enable active low	Pin 2:	Do not connect

"Enable" means the input has to be put into the active state (whether active high or low) for the module output to give set volts. If the signal wire is disconnected, the module output falls to 1 - 1.5 volts.
"Inhibit" means the input has to be put into the active state (whether active high or low) for the module output to fall to 1 - 1.5 volts. If the signal wire is disconnected, the module output rises to the set voltage.

The three options are different configurations of the same small additional card which plugs into the module control card. Access to the signal is by means of a Molex connector at the "break-out" window in the module front panel. (Connector type: Molex 5569-NA1).



Pin 1: Inhibit high/enable low: Non-isolated input referenced to the negative power
Pin 2: Inhibit low / enable high: Output of the module. The module starts or stops within 30mSecs of an input transition.
Typical input impedance: 10 -20k_
Typical switching levels: "Low "State: 10% Vout "High" State: 90% Vout
Typical Output of Inhibited / Disabled Module: 1 -1.5 volts

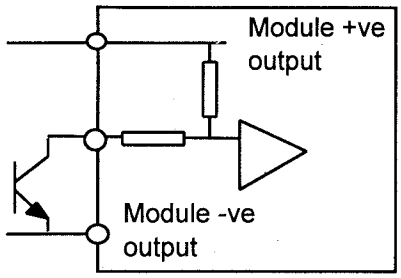
Note:
There are currently three versions of the Y6, Y7 and Y8 option cards, one for each Module output voltage range. The correct version will automatically by supplied with configured Omega power supplies. For Field retrofits, care must be taken to ensure the correct voltage range is specified.
Power good can not be tested fully on a boxed unit. A full test is only possible during manufacture.

Pin 3: Power Good (+): Collector of Opto isolated NPN transistor which is on when the Output voltage is within + / - 10% of the set value.

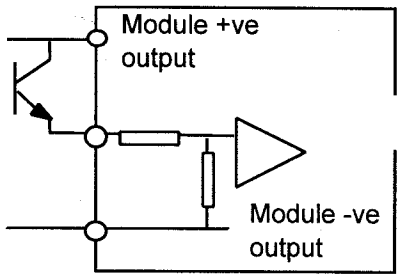
Max. current:	5mA at Vce = 1.5V
Typically:	1mA at Vce = 0.5V
Max. collector - emitter voltage:	80V
Isolation from earth and other module outputs	>500Vdc

Pin 4: Power Good (-): Emitter of opto-isolated NPN transistor.

Typical interface circuit for Module Inhibit/Enable:

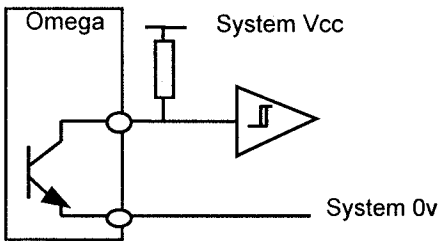


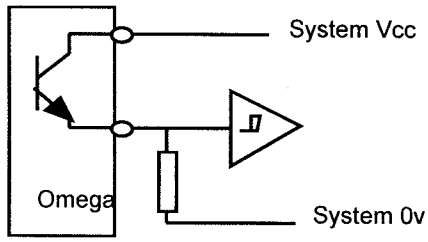
Active Low input



Active High input

Typical Interface circuits for Power Good:





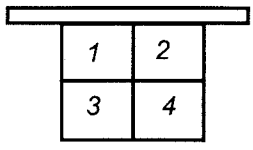
Notes:

1. For "Module Good" to function correctly, ensure a 10% minimum load on the output module.

VME Type Option Card

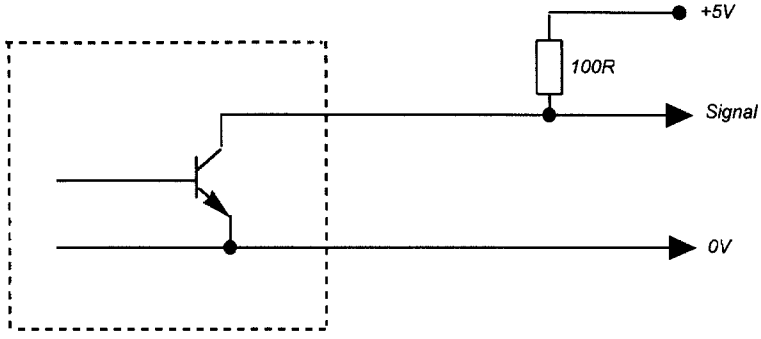
1.0 This option card can be used to deliver VME type information.

1.1 Connections: The VME type signals are connected to zero volts common ground and are not isolated from the output of the module.

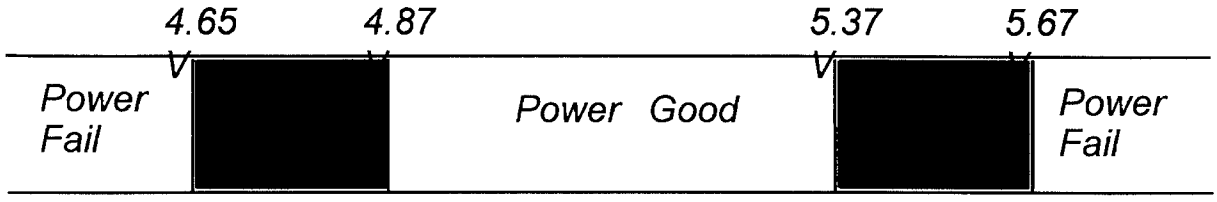


1: ACFAIL
2: SYSRESET
3: POWER GOOD
4: GROUND

1.2 Outputs are open collector and able to sink a maximum of 50mA. Typical external circuitry is shown below. The maximum external supply voltage is +10Vdc.

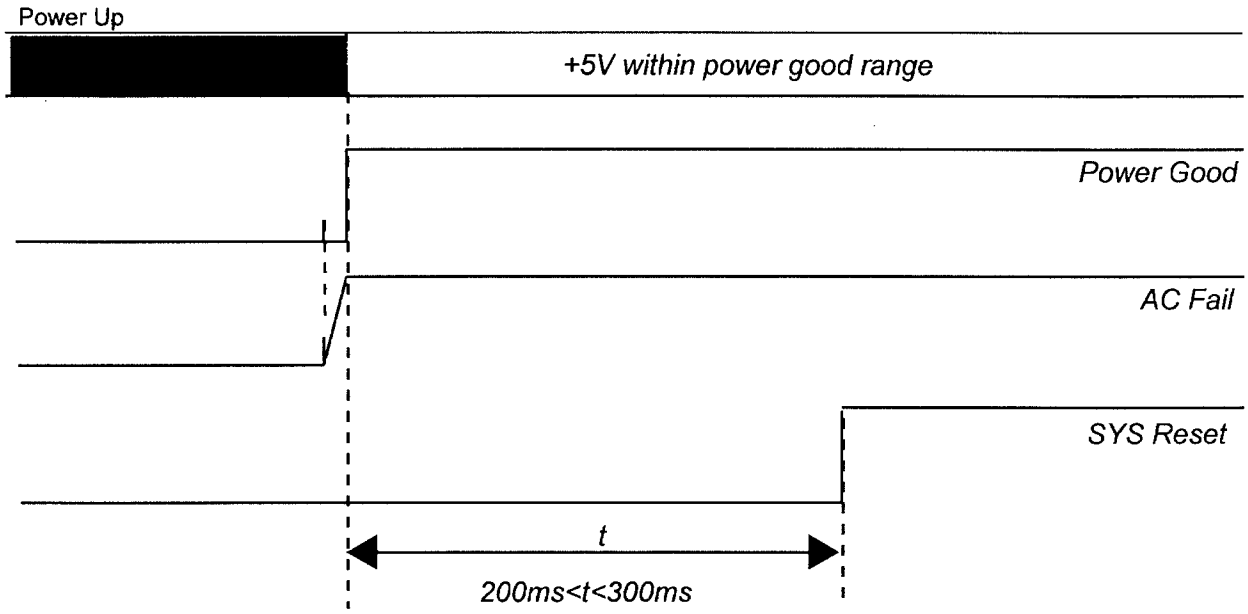


1.3 The power good is set as below, tolerances are as shown. The output 5V must be set within the 5.0V and 5.3V.

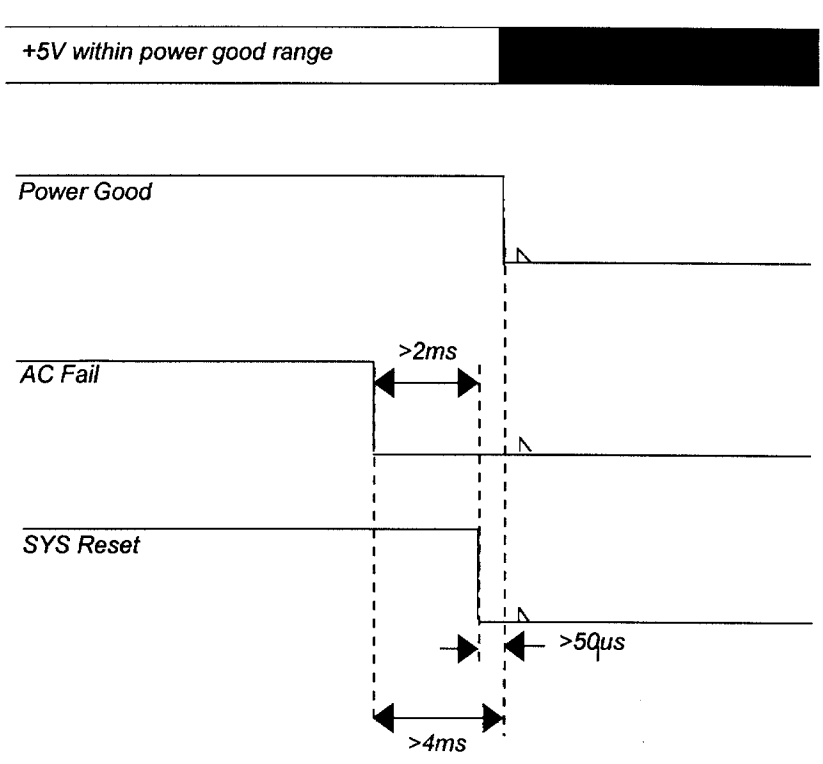


Power good signal will change state in the highlighted region.

2.0 Timing Signals



Power Down



Notes:

1. Outputs have small spikes when option circuitry powered from module outputs. Spike is less than 1V on ACFAIL and SYSRESET, and less than 2V on POWER GOOD.
2. Module must be under minimum load of 15% for Non-Power Factor Corrected units with input mains under 200Vac, or 10% for Power Factor Corrected units, 400DC units and units operating at mains voltages of 200Vac and above.