

QM7

AC/DC Modular Power Supply Series

APPLICATION NOTES



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1. INPUT

AC INPUT LINE REQUIREMENTS

Please see the datasheet for the specification of input line requirements (including Input voltage range, input frequency, input harmonics, input current and leakage current). Note 1500W output is only available at high-line 150-264Vac.

The power supply will automatically recover from AC power loss and start-up with maximum loading at 90VAC.

Repetitive ON/OFF cycling of the AC input voltage will not damage the power supply or cause the input fuse to blow.

- Input Fuses

One ('E' input fuse option) or two ('D' input fuse option) internal fuses are fitted. The fuses are not user serviceable and are fast acting rated 25A / 250Vac HBC types.

- Input Undervoltage

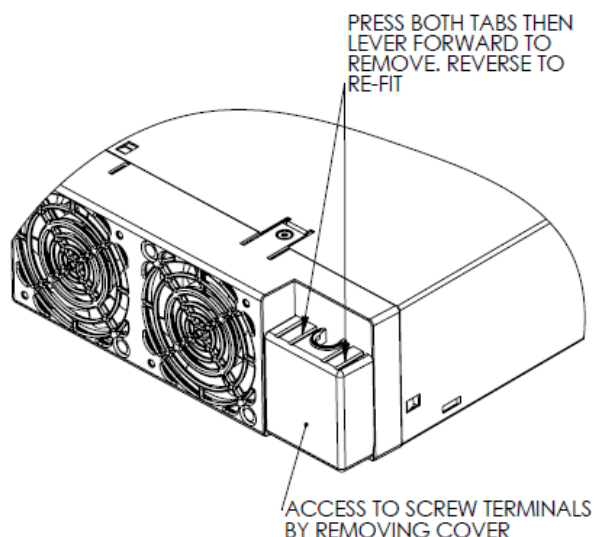
The power supply is protected against the application of an input voltage below the minimum specified so that it shall not cause damage to the power supply.

AC INPUT CONNECTIONS

- QM7 with factory fitted fan – F or R type cooling

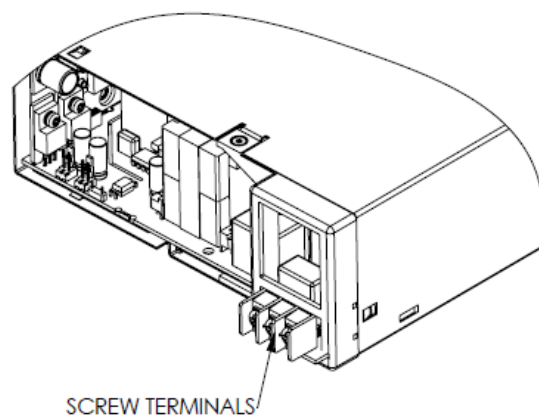
To access the AC terminal block remove terminal block cover by pressing both tabs and pulling forward.

Perform the reverse operation to re-fit.



- QM7 with customer supplied airflow – C type cooling

No fan or terminal block cover is fitted with the customer supplied air option



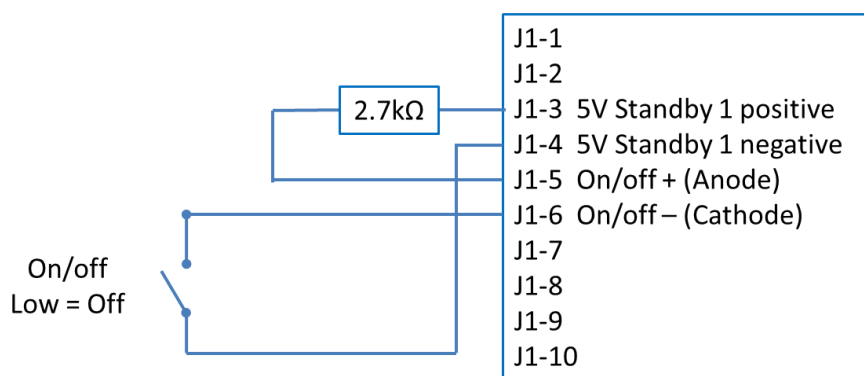
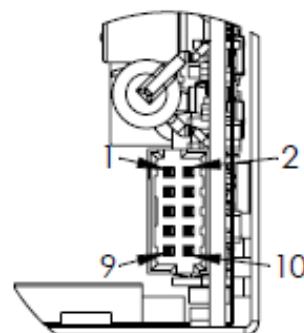
2. STANDBY / SIGNALS OPTION

When fitted, the standby / signals option module is situated in the far right hand position of the QM chassis (when looking at the output end of the power supply).

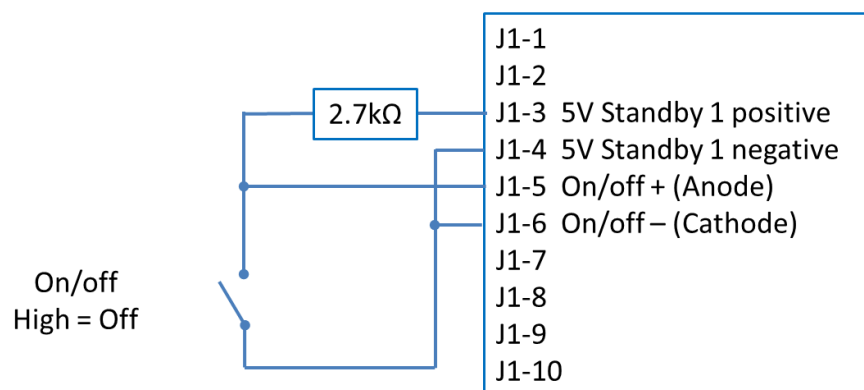
Standby 1 is an isolated 5V 0.25A output and is always present provided AC is applied to the QM

Standby 2 is an isolated output, the voltage and current selectable at the time of ordering. The output is always present provided AC is applied to the QM.

PSU on/off is controlled through an isolated opto-coupler diode input. Passing a minimum of 1mA (10mA maximum) through the opto diode will either “enable” (turn on) the QM power supply, or “inhibit” (turn off) the QM. Note, when turned off, the internal cooling fans will not operate.

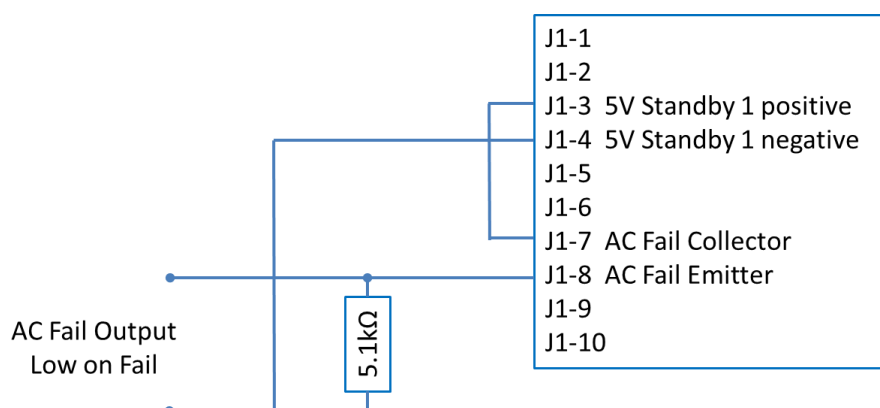


Inhibit



Enable

AC Fail is an isolated opto-coupler transistor output. Pin 7 is the collector and pin 8 the emitter. This signal provides a warning that the AC is not present (or out of range) and the outputs will be losing regulation after 5ms. The transistor is “on” when the AC is good. It is recommended that the AC Fail is connected to the 5V standby 1 supply with a 5.1kΩ series resistor to limit the current.



Connector Pinout for Standby / signals option			
Pin No.	E5L or T5L	E5H, T5H, E12H or T12H	E13.5H or T13.5H
1	No connection	Standby 2 +	
2		Standby 2 -	
3		Standby 1 +	
4		Standby 1 -	
5		PSU on/off + (Anode)	
6		PSU on/off – (Cathode)	
7		AC Fail Collector	
8		AC Fail Emitter	
9	No connection		On/off logic 0
10			On/off logic 1

Molex mating connectors and pins (Contact Molex for other pin alternatives)

- 10 way Milli-Grid with locking ramp Part no. 0511101056
- 10 way Milli-grid without locking ramp Part no. 0511101051
- Crimp terminal, gold flash, female, supplied on a reel Part no. 0503948054
- Crimp terminal, gold flash, female, supplied in a bag Part no. 0503948400
- Crimp terminal, tin plated, female, supplied on a reel Part no. 1510878101

3. DC OUTPUTS

DH Modules

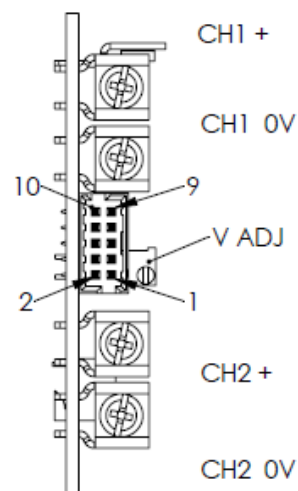
The output voltages can be adjusted across the range shown in the datasheet by using the potentiometer situated to the right of the signal connector. Turning the potentiometer clockwise will increase both the output voltages.

Channel 2 tracks channel 1. The output voltage for $V2 = V2_{max} \times V1(\text{actual set point}) / V1_{max}$ *

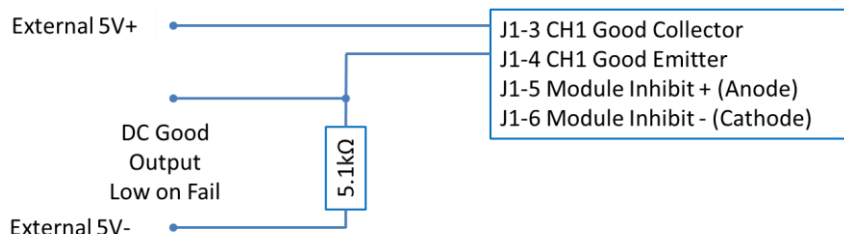
* Maximum adjustment voltage as shown in the datasheet

For example:

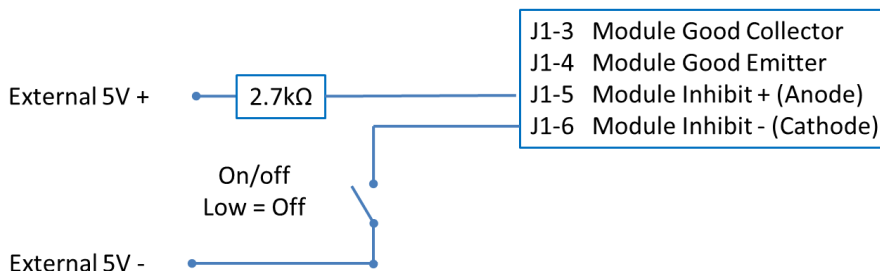
V1	V1 max	V2 max	V2
12.5V	13.8V	13.8V	12.5V



The Module Good signal is an isolated (200V from CH1) opto-coupler transistor output. This signal provides an indication that CH1 is above 90% of the output set voltage. The transistor is on when the module is "good".



Module inhibit is an isolated opto-coupler diode input. Passing a minimum of 1mA through the diode will inhibit (turn off) both outputs of the module.



Molex mating connectors and pins (Contact Molex for other pin alternatives)

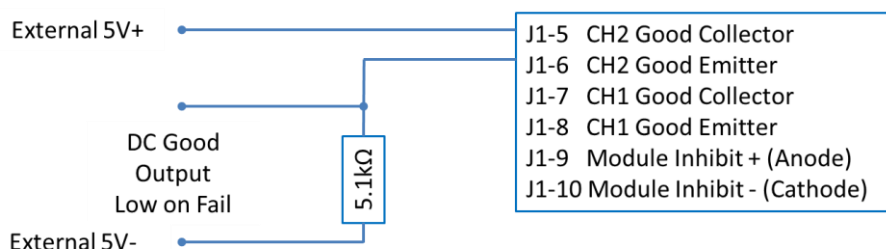
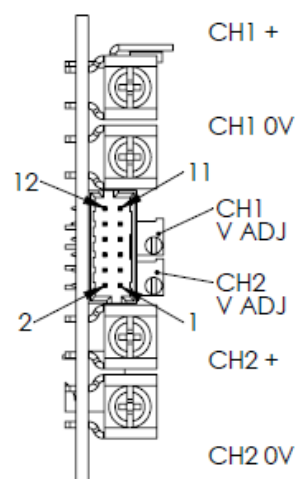
- 10 way Milli-Grid with locking ramp Part no. 0511101056
- 10 way Milli-grid without locking ramp Part no. 0511101051
- Crimp terminal, gold flash, female, supplied on a reel Part no. 0503948054
- Crimp terminal, gold flash, female, supplied in a bag Part no. 0503948400
- Crimp terminal, tin plated, female, supplied on a reel Part no. 1510878101

DM Modules

Channel 1 and 2 output voltages can be adjusted across the range shown in the datasheet by using the potentiometer situated to the right of the signal connector. Channel 1 potentiometer is the upper one, closest to the Channel 1 output terminals. Turning the potentiometer clockwise increases the output voltage.

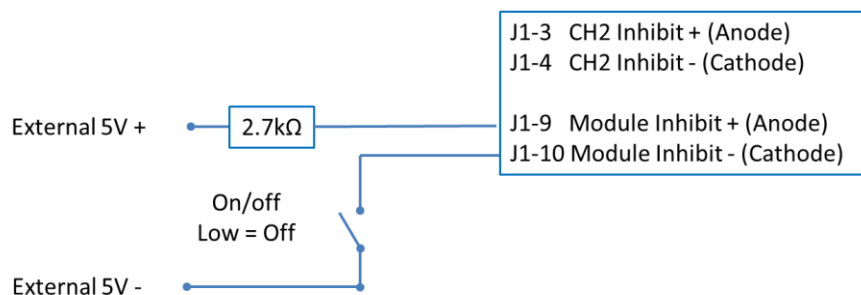
Remote sense for Channel 1 and 2 provides compensation for a maximum total load cable drop of 0.5V for each output. The voltage at the output terminals must be within the specified adjustment range.

The CH1 and CH2 Good signals are isolated (200V from each output) opto-coupler transistor outputs. These signals provide an indication that each output is above 90% of the output set voltage. The transistor is on when the output is "good".

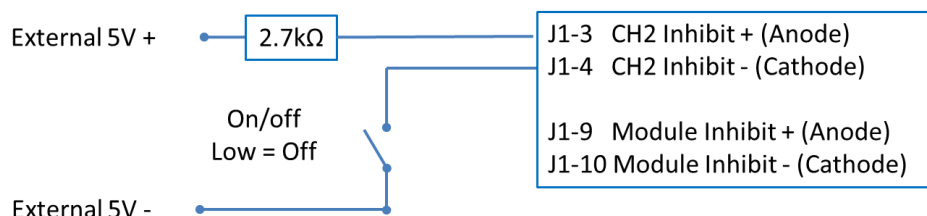


CH2 Good connection shown, use J1-7 & J1-8 for CH2 Good

Module inhibit is an isolated opto-coupler diode input. Passing a minimum of 1mA through the diode will inhibit (turn off) both outputs of the module.



CH2 inhibit is an isolated opto-coupler diode output. Passing a minimum of 1mA through the diode will only inhibit (turn off) Channel 2 of the module.



Pin	Function
1	CH2 Sense +
2	CH2 Sense -
3	CH2 Inhibit + (Anode)
4	CH2 Inhibit + (Cathode)
5	CH2 Good Collector
6	CH2 Good Emitter
7	CH1 Good Collector
8	CH1 Good Emitter
9	Module Inhibit + (Anode)
10	Module Inhibit – (Cathode)
11	CH1 Sense +
12	CH1 Sense -

Molex mating connectors and pins (Contact Molex for other pin alternatives)

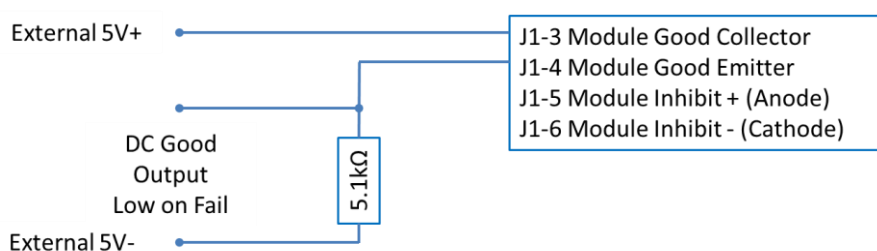
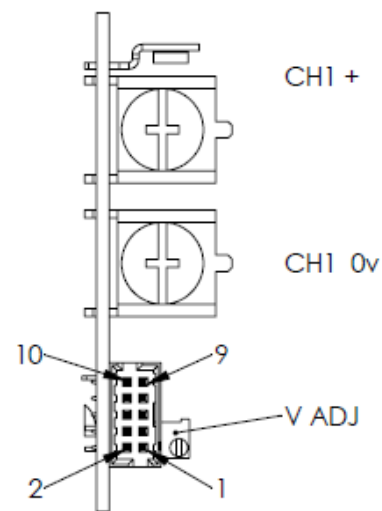
- 12 way Milli-Grid with locking ramp Part no. 0511101256
- 12 way Milli-grid without locking ramp Part no. 0511101251
- Crimp terminal, gold flash, female, supplied on a reel Part no. 0503948054
- Crimp terminal, gold flash, female, supplied in a bag Part no. 0503948400
- Crimp terminal, tin plated, female, supplied on a reel Part no. 1510878101

SB Modules

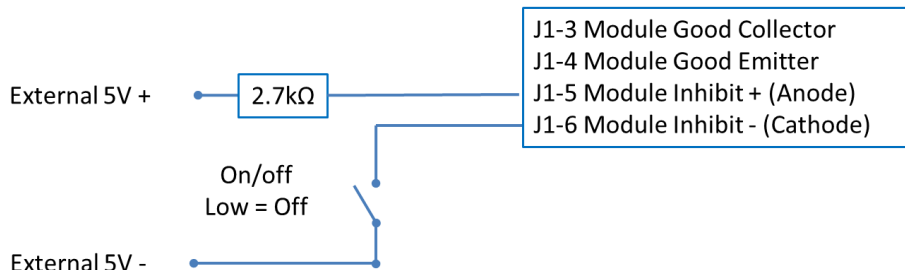
The output voltage can be adjusted across the range shown in the datasheet by using the potentiometer situated to the right of the signal connector. Turning the potentiometer clockwise increases the output voltage.

The remote sense provides compensation for a maximum total load cable drop of 0.5V for the output. The voltage at the output terminals must be within the specified adjustment range.

The Module Good signal is an isolated (200V from the output) opto-coupler transistor outputs. This signal provides an indication that the output is above 90% of the output set voltage. The transistor is on when the output is "good"



Module inhibit is an isolated opto-coupler diode input. Passing a minimum of 1mA through the diode will inhibit (turn off) the output of the module.



Pin	Function
1	No connection
2	
3	Module Good Collector
4	Module Good Emitter
5	Module Inhibit + (Anode)
6	Module Inhibit - (Cathode)
7	Remote Sense +
8	Remote Sense -
9	No connection
10	

Molex mating connectors and pins (Contact Molex for other pin alternatives)

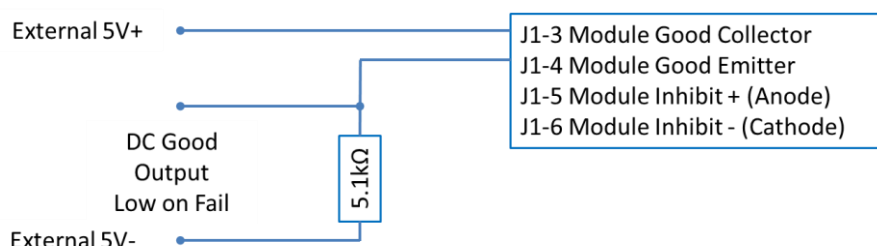
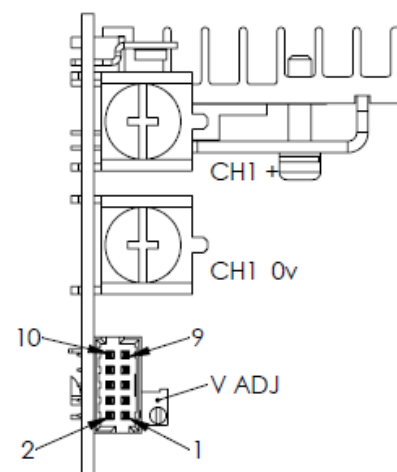
- 10 way Milli-Grid with locking ramp Part no. 0511101056
- 10 way Milli-grid without locking ramp Part no. 0511101051
- Crimp terminal, gold flash, female, supplied on a reel Part no. 0503948054
- Crimp terminal, gold flash, female, supplied in a bag Part no. 0503948400
- Crimp terminal, tin plated, female, supplied on a reel Part no. 1510878101

SC Modules

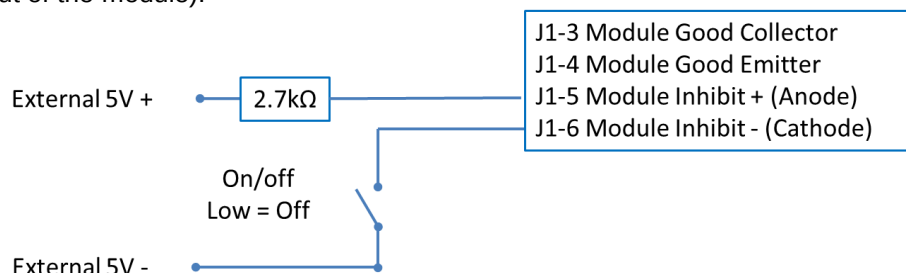
The output voltage can be adjusted across the range shown in the datasheet by using the potentiometer situated to the right of the signal connector. Turning the potentiometer clockwise increases the output voltage.

The remote sense provides compensation for a maximum total load cable drop of 0.5V for the output. The voltage at the output terminals must be within the specified adjustment range.

The Module Good signal is an isolated (200V from the output) opto-coupler transistor outputs. This signal provides an indication that the output is above 90% of the output set voltage. The transistor is on when the output is "good".



Module inhibit is an isolated opto-coupler diode input. Passing a minimum of 1mA through the diode will inhibit (turn off) the output of the module).



Pin	Function
1	No connection
2	
3	Module Good Collector
4	Module Good Emitter
5	Module Inhibit + (Anode)
6	Module Inhibit - (Cathode)
7	Remote Sense +
8	Remote Sense -
9	No connection
10	

Molex mating connectors and pins (Contact Molex for other pin alternatives)

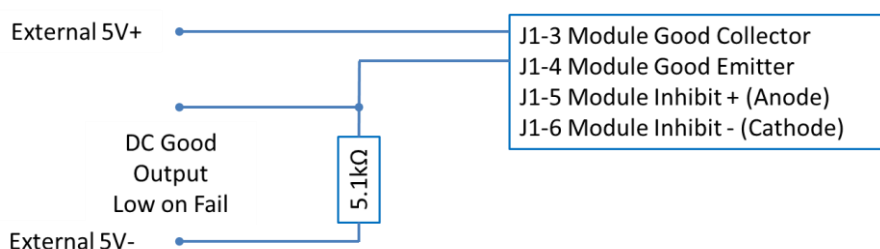
- 10 way Milli-Grid with locking ramp Part no. 0511101056
- 10 way Milli-grid without locking ramp Part no. 0511101051
- Crimp terminal, gold flash, female, supplied on a reel Part no. 0503948054
- Crimp terminal, gold flash, female, supplied in a bag Part no. 0503948400
- Crimp terminal, tin plated, female, supplied on a reel Part no. 1510878101

YB Modules

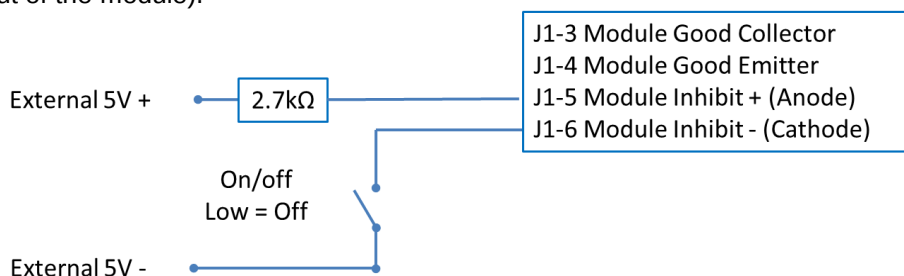
The YB module consists of a DH module preconfigured with outputs connected in series.

The output voltage can be adjusted across the range shown in the datasheet by using the potentiometer situated to the right of the signal connector. Turning the potentiometer clockwise increases the output voltage.

The Module Good signal is an isolated (200V from the output) opto-coupler transistor outputs. This signal provides an indication that the output is above 90% of the output set voltage. The transistor is on when the output is "good".



Module inhibit is an isolated opto-coupler diode input. Passing a minimum of 1mA through the diode will inhibit (turn off) the output of the module).



Pin	Function
1	No connection
2	
3	Module Good Collector
4	Module Good Emitter
5	Module Inhibit + (Anode)
6	Module Inhibit - (Cathode)
7	No connection
8	
9	
10	

Molex mating connectors and pins (Contact Molex for other pin alternatives)

- 10 way Milli-Grid with locking ramp Part no. 0511101056
- 10 way Milli-grid without locking ramp Part no. 0511101051
- Crimp terminal, gold flash, female, supplied on a reel Part no. 0503948054
- Crimp terminal, gold flash, female, supplied in a bag Part no. 0503948400
- Crimp terminal, tin plated, female, supplied on a reel Part no. 1510878101

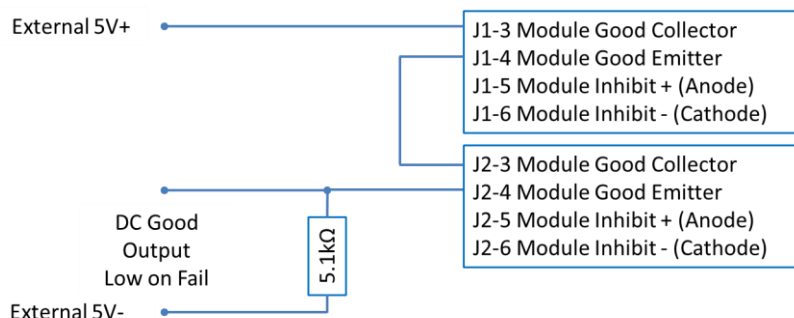
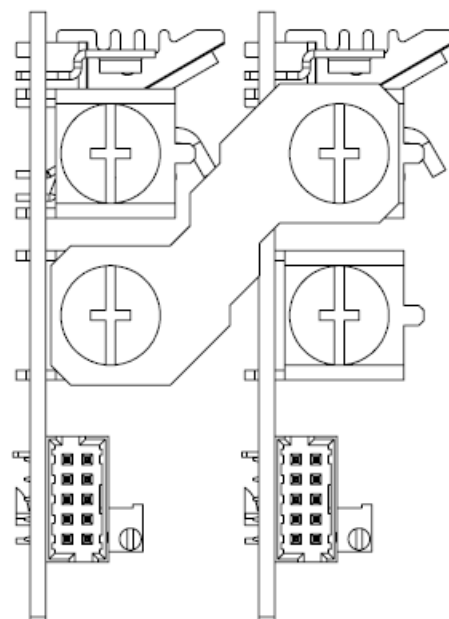
YC Modules

The output voltage can be adjusted from the factory set point across the range shown in the datasheet by performing the following operation:

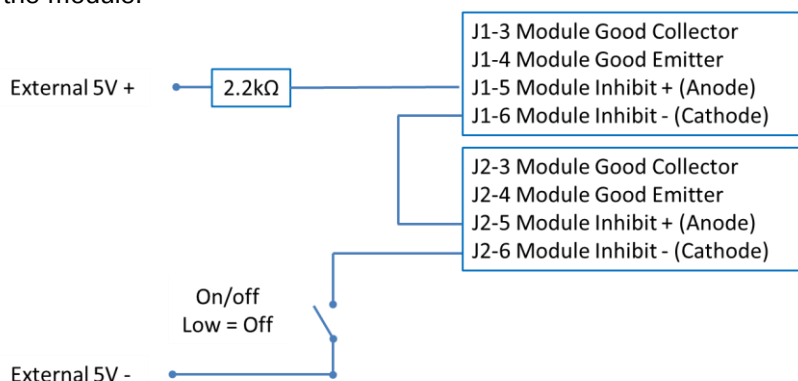
- Apply AC power
- Individually adjust both potentiometers, situated to the right of the signal connectors, so that the output voltage of each board assembly is 50% of the desired output voltage. Turning the potentiometer clockwise increases the output voltage.
- Confirm that the module has the desired output voltage

The remote sense provides compensation for a maximum total load cable drop of 0.5V for the output. The voltage at the output terminals must be within the specified adjustment range. Connect J1 Pin 8 to J2 Pin 7.

The Module Good signal is an isolated (200V from the output) opto-coupler transistor output. This signal provides an indication that the output is above 90% of the output set voltage. The transistor is on when the output is "good".



Module inhibit is an isolated opto-coupler diode input. Passing a minimum of 1mA through the diode will inhibit (turn off) the output of the module.



Pin	Function (J1 Left Connector)	Function (J2 Right Connector)
1	No connection	No connection
2		
3	Module Good Collector	Module Good Collector
4	Module Good Emitter	Module Good Emitter
5	Module Inhibit + (Anode)	Module Inhibit + (Anode)
6	Module Inhibit - (Cathode)	Module Inhibit - (Cathode)
7	Remote Sense +	Remote Sense +
8	Remote Sense -	Remote Sense -
9	No connection	No connection
10		

Molex mating connectors and pins (Contact Molex for other pin alternatives)

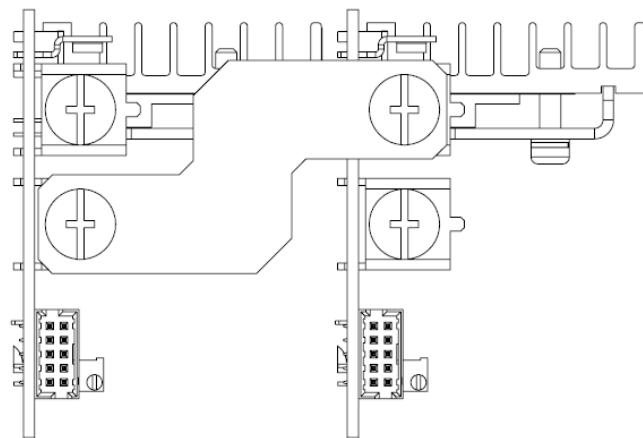
- 10 way Milli-Grid with locking ramp Part no. 0511101056
- 10 way Milli-grid without locking ramp Part no. 0511101051

- Crimp terminal, gold flash, female, supplied on a reel Part no. 0503948054
- Crimp terminal, gold flash, female, supplied in a bag Part no. 0503948400
- Crimp terminal, tin plated, female, supplied on a reel Part no. 1510878101

YF Modules

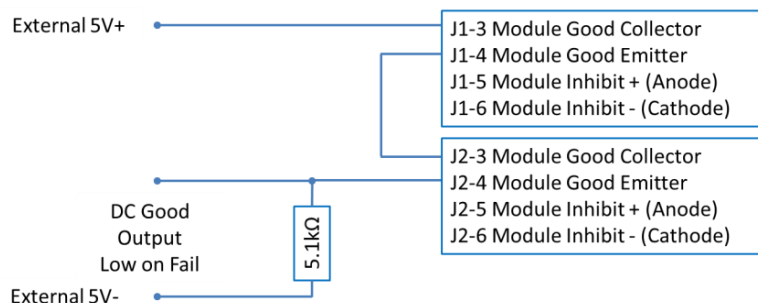
The output voltage can be adjusted from the factory set point across the range shown in the datasheet by performing the following operation:

- Apply AC power
- Individually adjust both potentiometers, situated to the right of the signal connectors, so that the output voltage of each board assembly is 50% of the desired output voltage. Turning the potentiometer clockwise increases the output voltage.
- Confirm that the module has the desired output voltage

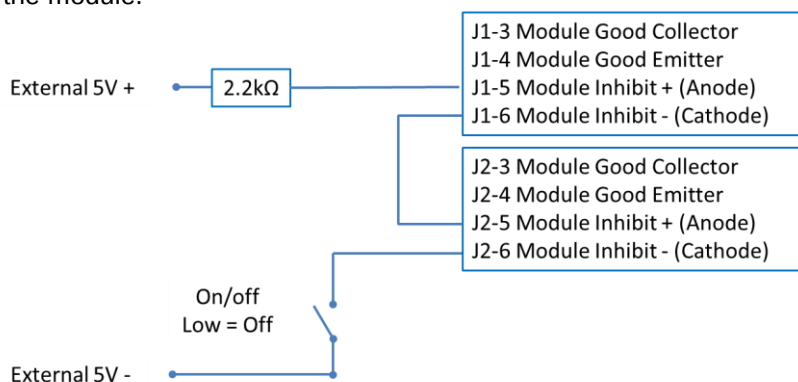


The remote sense provides compensation for a maximum total load cable drop of 0.5V for the output. The voltage at the output terminals must be within the specified adjustment range. Connect J1 Pin 8 to J2 Pin 7.

The Module Good signal is an isolated (200V from the output) opto-coupler transistor output. This signal provides an indication that the output is above 90% of the output set voltage. The transistor is on when the output is "good".



Module inhibit is an isolated opto-coupler diode input. Passing a minimum of 1mA through the diode will inhibit (turn off) the output of the module.



Pin	Function (J1 Left Connector)	Function (J2 Right Connector)
1	No connection	No connection
2		
3	Module Good Collector	Module Good Collector
4	Module Good Emitter	Module Good Emitter
5	Module Inhibit + (Anode)	Module Inhibit + (Anode)
6	Module Inhibit - (Cathode)	Module Inhibit - (Cathode)
7	Remote Sense +	Remote Sense +
8	Remote Sense -	Remote Sense -
9	No connection	No connection
10		

Molex mating connectors and pins (Contact Molex for other pin alternatives)

- 10 way Milli-Grid with locking ramp Part no. 0511101056
- 10 way Milli-grid without locking ramp Part no. 0511101051

- Crimp terminal, gold flash, female, supplied on a reel Part no. 0503948054
- Crimp terminal, gold flash, female, supplied in a bag Part no. 0503948400
- Crimp terminal, tin plated, female, supplied on a reel Part no. 1510878101

ZD Modules

The output voltage can be adjusted from the factory set point across the range shown in the datasheet by performing the following operation:

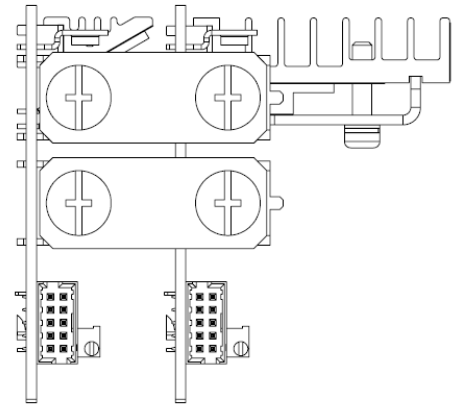
- Disconnect the AC power, then remove the two busbars connecting the Ch1 + and Ch1 0V terminals together
- Re-apply AC power
- Apply the load specified in the module table below to each of the modules which make up the Z module.
- Individually adjust both potentiometers, situated to the right of the signal connectors, so that the output voltage of each board assembly is at the desired set point. Each output voltage must be within the following tolerances:

For modules <10V: +/-0.1% of the desired voltage set point

For modules >10V: +/-0.25% of the desired voltage set point

Turning the potentiometer clockwise increases the output voltage

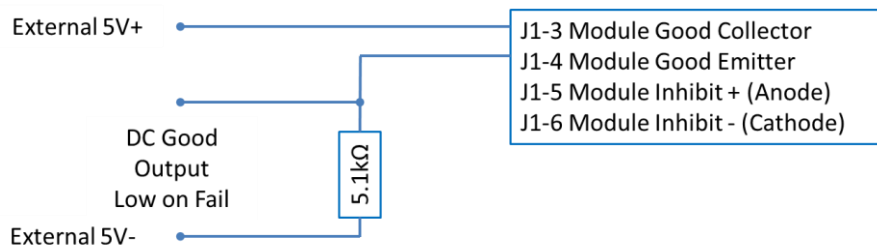
- Reconnect the two busbars and reapply AC power
- Confirm that the module has the desired output voltage



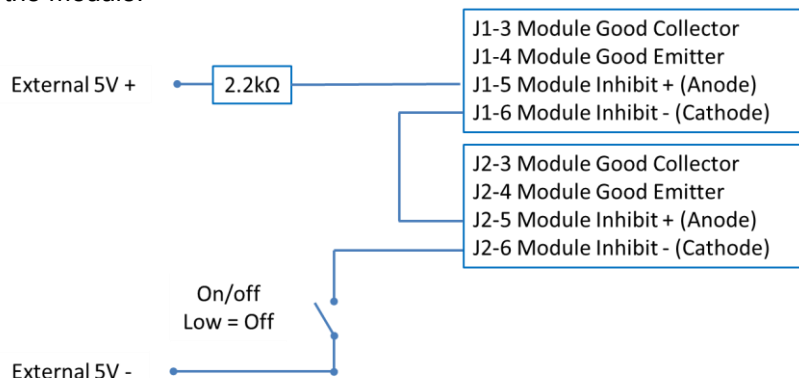
Output voltage range	Load to apply while adjusting output	
	Left hand module	Right hand module
5-5.3V	150W	300W
12-12.8V	300W	600W
24-25.6V	300W	600W
48-51.2V	300W	600W

The remote sense provides compensation for a maximum total load cable drop of 0.5V for the output. The voltage at the output terminals must be within the specified adjustment range.

The Module Good signal is an isolated (200V from the output) opto-coupler transistor output. This signal provides an indication that the output is above 90% of the output set voltage. The transistor is on when the output is "good".



Module inhibit is an isolated opto-coupler diode input. Passing a minimum of 1mA through the diode will inhibit (turn off) the output of the module.



Pin	Function (J1 Left Connector)	Function (J2 Right Connector)
1	No connection	No connection
2		
3	Module Good Collector	Module Good Collector
4	Module Good Emitter	Module Good Emitter
5	Module Inhibit + (Anode)	Module Inhibit + (Anode)
6	Module Inhibit - (Cathode)	Module Inhibit - (Cathode)
7	Remote Sense +	Remote Sense +
8	Remote Sense -	Remote Sense -
9	No connection	No connection
10		

Molex mating connectors and pins (Contact Molex for other pin alternatives)

- 10 way Milli-Grid with locking ramp Part no. 0511101056
- 10 way Milli-grid without locking ramp Part no. 0511101051
- Crimp terminal, gold flash, female, supplied on a reel Part no. 0503948054
- Crimp terminal, gold flash, female, supplied in a bag Part no. 0503948400
- Crimp terminal, tin plated, female, supplied on a reel Part no. 1510878101

ZF Modules

The output voltage can be adjusted from the factory set point across the range shown in the datasheet by performing the following operation:

- Disconnect the AC power, then remove the two busbars connecting the Ch1 + and Ch1 0V terminals together
- Re-apply AC power
- Apply the load specified in the module table below to each of the modules which make up the Z module.
- Individually adjust both potentiometers, situated to the right of the signal connectors, so that the output voltage of each board assembly is at the desired set point. Each output voltage must be within the following tolerances:

For modules <10V: +/-0.1% of the desired voltage set point
For modules >10V: +/-0.25% of the desired voltage set point

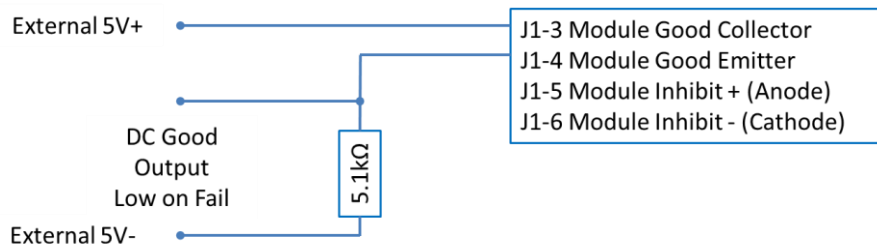
Turning the potentiometer clockwise increases the output voltage

- Reconnect the two busbars and reapply AC power
- Confirm that the module has the desired output voltage

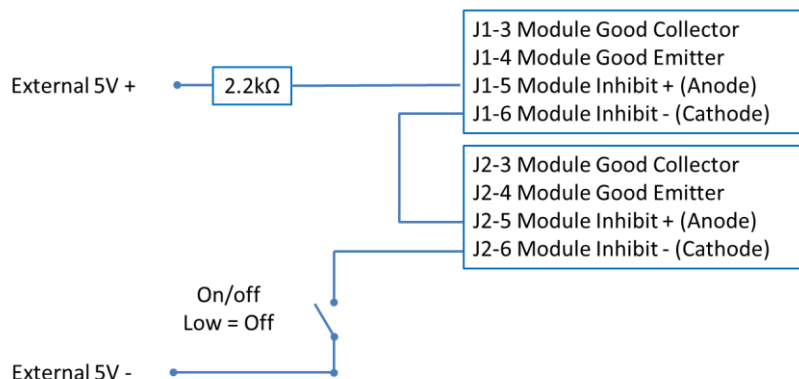
Output voltage range	Load to apply while adjusting output	
	Left hand module	Right hand module
5-5.3	300W	300W
12-12.8	600W	600W
36-38.4	600W	600W

The remote sense provides compensation for a maximum total load cable drop of 0.5V for the output. The voltage at the output terminals must be within the specified adjustment range.

The Module Good signal is an isolated (200V from the output) opto-coupler transistor outputs. This signal provides an indication that the output is above 90% of the output set voltage. The transistor is on when the output is "good".



Module inhibit is an isolated opto-coupler diode output. Passing a minimum of 1mA through the diode will inhibit (turn off) the output of the module).



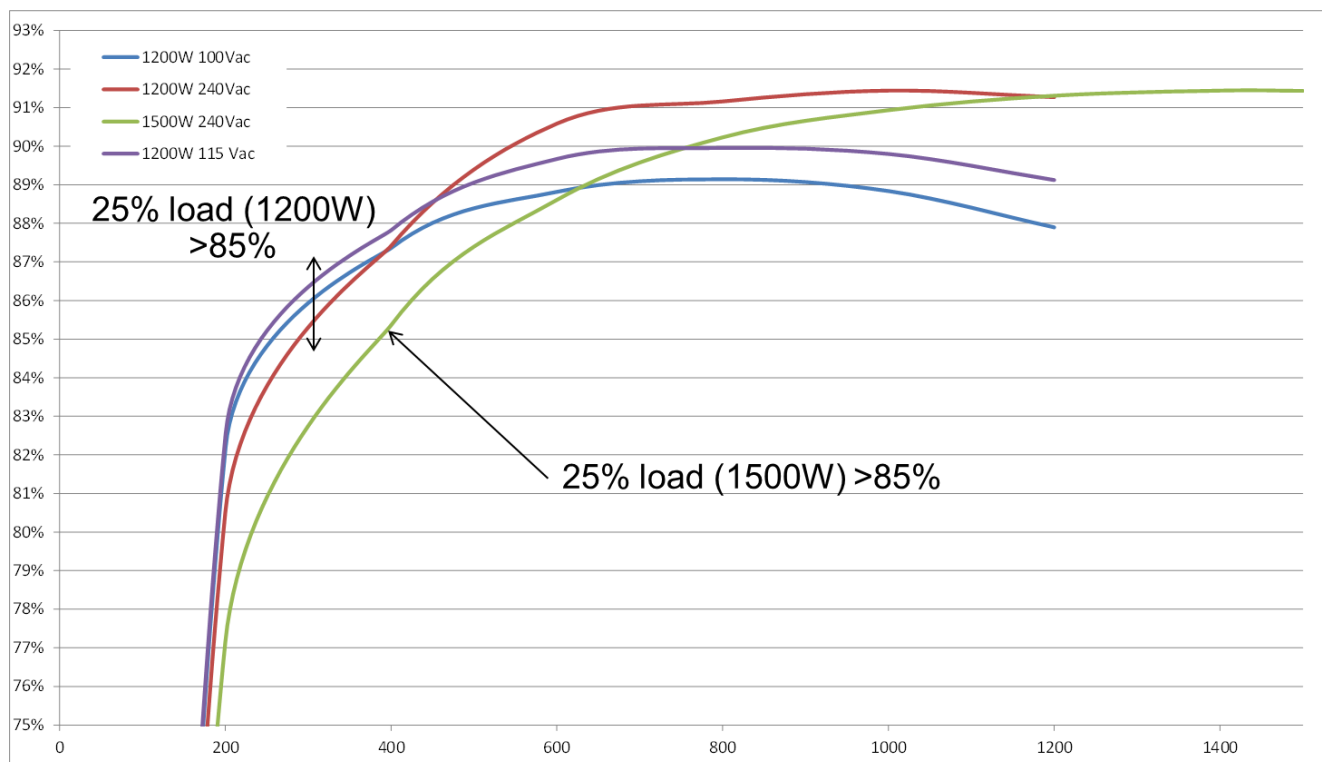
Pin	Function (J1 Left Connector)	Function (J2 Right Connector)
1	No connection	No connection
2		
3	Module Good Collector	Module Good Collector
4	Module Good Emitter	Module Good Emitter
5	Module Inhibit + (Anode)	Module Inhibit + (Anode)
6	Module Inhibit - (Cathode)	Module Inhibit - (Cathode)
7	Remote Sense +	Remote Sense +
8	Remote Sense -	Remote Sense -
9	No connection	No connection
10		

Molex mating connectors and pins (Contact Molex for other pin alternatives)

- 10 way Milli-Grid with locking ramp Part no. 0511101056
- 10 way Milli-grid without locking ramp Part no. 0511101051
- Crimp terminal, gold flash, female, supplied on a reel Part no. 0503948054
- Crimp terminal, gold flash, female, supplied in a bag Part no. 0503948400
- Crimp terminal, tin plated, female, supplied on a reel Part no. 1510878101

4. EFFICIENCY

The following chart shows the measured efficiency of a QM7FSDL 24SCS 24SCS 24SCS configuration.



5. POWER SUPPLY OPERATION

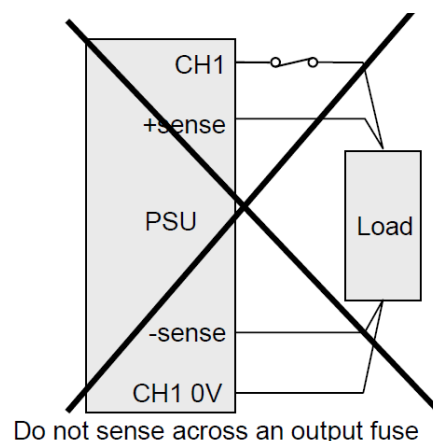
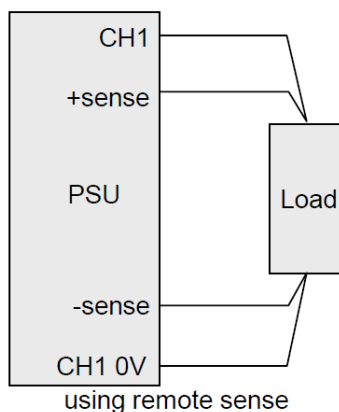
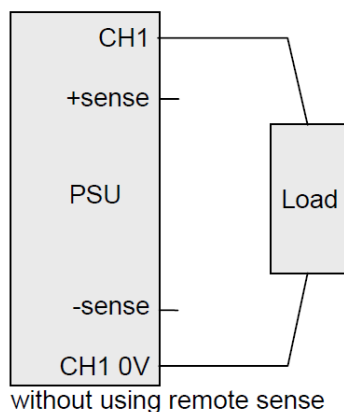
NO LOAD OPERATION

No minimum load is required for the power supply to operate within specification.

REMOTE SENSE

Remote sensing is provided on select modules to compensate for voltage drops in the power connections to the load. The remote sense lines may be connected as follows:

- If remote sense is not required, simply do not connect either '+sense' or '-sense'
- If remote sense is required, connect '-sense' and '+sense' to the corresponding point at the load (see the drawing below for details)
- Note – do not connect remote sense across an output fuse



CAPACITIVE LOAD OPERATION

Please refer to the QM7 datasheet for maximum output capacitance load values.

TRANSIENT LOAD OPERATION – DM MODULES

Under the following conditions it is possible to get a negative transient on Ch2 that is greater than 10%:

Ch1 is set to min Vo
500uF/A on both outputs

And either:

0 – 100% transient on Ch1 with Full load on Ch2

Or

No load on Ch1 With 0 – 100% transient on Ch2.

The transient deviation can be reduced to less than 10% if a minimum load is applied to Ch1 as follows:

		Load W	Min load Ch1
Module	14(12)/3v3	120W/30W	5% (0.5A)
	14(12)/5	120W/50W	5% (0.5A)
	14(12)/12	100W/100W	6% (0.5A)
	14(12)/24	100W/100W	6% (0.5A)
	24/3v3	120W/30W	8% (0.4A)
	24/5	120W/50W	8% (0.4A)
	24/24	100W/100W	10% (0.4A)

Note: The maximum frequency for the transients is 25Hz, above this frequency the deviation can be bigger than specified. Reducing the external output capacitance can be beneficial, but this would need to be evaluated in each application.

SERIES CONNECTION

It is possible to connect two identical DH module outputs or two identical single output SB and SC modules in series.

The outputs connected in series are non-SELV (Safety Extra Low Voltage) if the total output voltage plus 30% of the highest maximum rated output voltage, exceeds 60V (the 30% addition allows for a single fault in any one individual channel).

PARALLEL CONNECTION

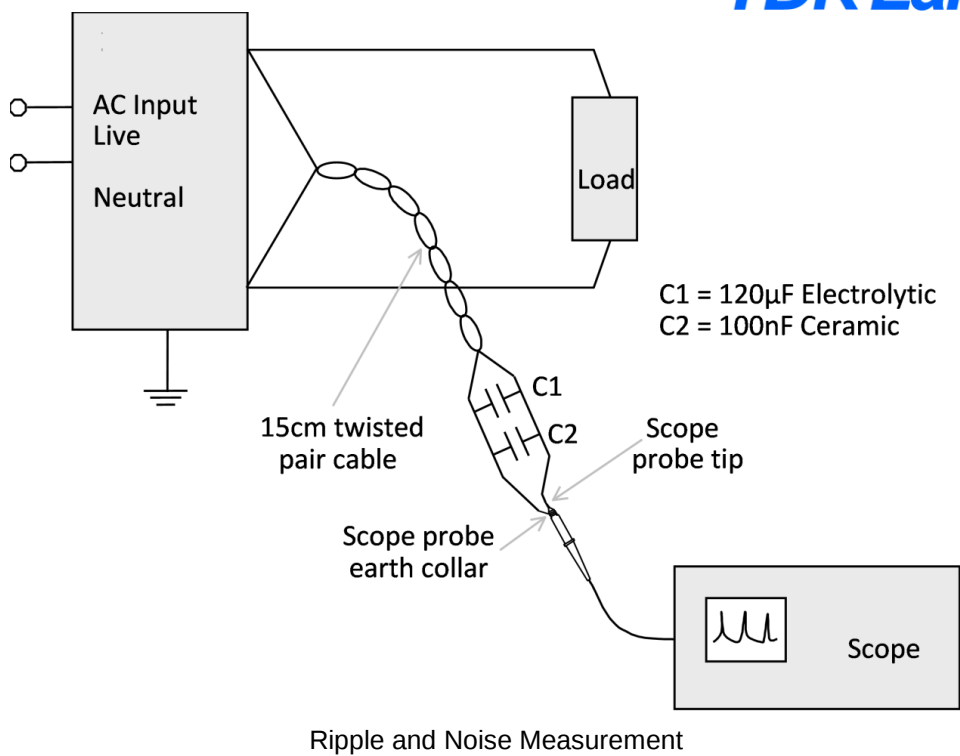
Parallel connection is possible to connect up to 2 same voltage SB and SC modules in parallel but droop mode (-D) operation must be specified on each module.

6. OUTPUT CHARACTERISTICS

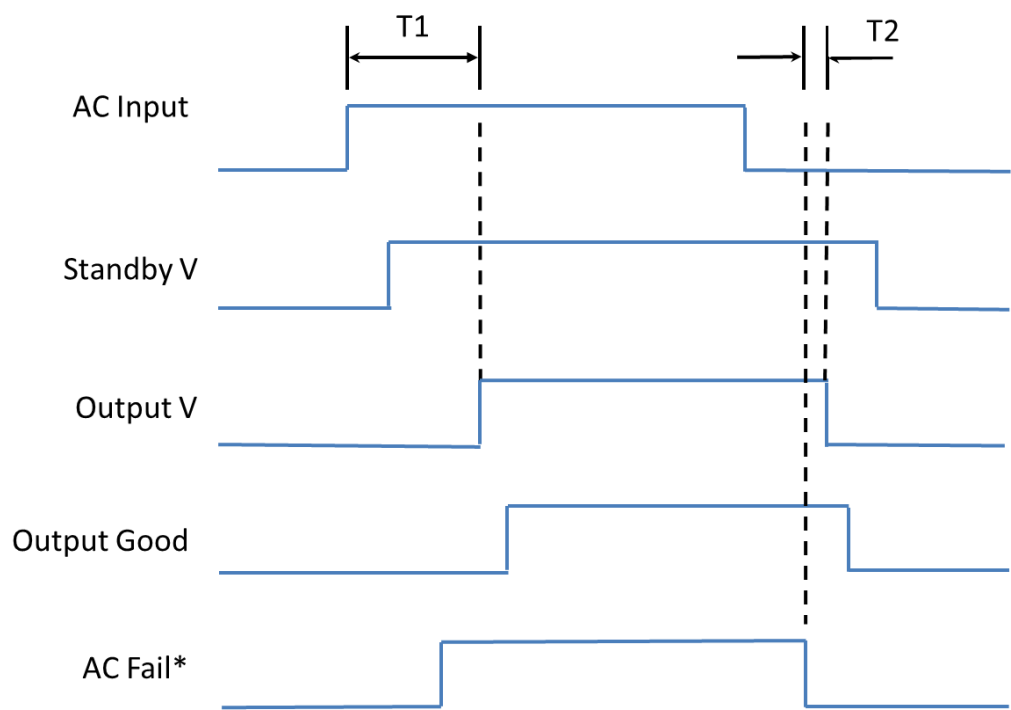
RIPPLE AND NOISE

Ripple and noise is defined as periodic or random signals over a frequency range of 10Hz to 20MHz.

Measurements are to be made with an 20MHz bandwidth oscilloscope. Measurements are taken at the end of a 150mm length of a twisted pair of cables, terminated with a 100nF ceramic capacitor and a 120μF electrolytic capacitor. The earth wire of the oscilloscope probe should be as short as possible; winding a link wire around the earth collar of the probe is the preferred method.



POWER SUPPLY TIMING



* Configured as Low On Fail

	Minimum	Nominal	Maximum
T1	-	-	2s
T2	5ms	-	-

7. POWER SUPPLY PROTECTION

No Load Operation

The power supply will operate with no load on the output with no damage or hazardous condition.

Overload and short circuit protection

An overload or short circuit condition on the output(s) will cause no damage to the power supply. The power supply may attempt to restart until the overload or short circuit is removed. After removal of the overload or short circuit, the power supply will automatically resume normal operation.

SB and SC modules may latch off with a hard short applied across the output terminals, requiring an on/off ac cycle to reset.

Over temperature protection

Main converter: In the event of the temperature rising beyond specified limits, the QM power supply converter will turn off, excluding the Standby voltages. Once normal temperatures are resumed, the QM will automatically resume normal operation.

Standby supplies: If overheating occurs then this will turn off. Once normal temperatures are resumed, the QM will automatically resume normal operation.

DH module: If overheating occurs, Channels 1 and 2 will turn off and the AC will need to be recycled.

DM module: If overheating occurs, Channels 1 and 2 will turn off and the AC will need to be recycled. If overheating occurs only on the Channel 2 secondary the module will automatically restart when once normal temperatures are reached.

SB, SC, Z & Y module: If overheating occurs, The output will turn off and the AC will need to be recycled

Over voltage protection

An overvoltage on the output will cause the output module to shut-down. To restart, remove the ac supply for a minimum of 10 seconds and then reapply. Note, an overvoltage on the standby supplies will require the ac to be removed for several minutes before restarting the unit.

8. COOLING REQUIREMENTS

The QM series has internal variable speed cooling fans. A minimum clearance of 50mm should be provided at the input and output ends to allow air to enter and exit the power supply.

If other fans are used in the system, ensure that the QM airflow direction is in the same direction. Failure to do this can result in the power supply overheating due to low air pressure.

9. RELIABILITY

MTBF

Test Specification and method: Telcordia SR332 Issue 3, 2011, Method I (Parts Count), 90% confidence level.

The failure rates in Failures Per Million Hours (FPMH) is given for the different sub-assemblies below at a confidence level of 90% in the table below at both 40°C and 25°C.

Assembly	Telcordia SR332 Issue 3 Failure Rate (FPMH)		
	70°C	40°C	25°C
EndCap & Fans	2.447114	0.786870	0.409565
1200W Converter	0.506562	0.164414	0.094599
High Power Global Option	0.381561	0.101872	0.058265
Low Power Global Option	0.082589	0.010031	0.003370
5V SB or SC Module	0.592830	0.170151	0.103994
12V & 24V SB or SC Module	0.525817	0.153305	0.085817
DM Module	0.676589	0.210756	0.162498
DH Module	0.460206	0.148792	0.088424

Unlike earlier versions of Telcordia SR332, issue 3 uses probabilistic mathematics to calculate failure rates of assemblies. Therefore to get an accurate overall failure rate of a whole unit you cannot simply sum the failure rates of its constituent parts, as is done with other standards. But simply summing gives a reasonable, slightly pessimistic, approximation. See table below for a selection of configurations calculated correctly to Telcordia SR332 Issue 3, and approximated by summing the block failure rates.

Configuration	Telcordia SR332 Issue 3 Failure Rate (FPMH)			Telcordia SR332 Issue 3 MTBF (Hours)		
	70°C	40°C	25°C	70°C	40°C	25°C
QM7FSDLT5H 24SCS 24SCS	4.174175	1.300047	0.697520	239,568	769,203	1,433,651
As above summing block failure rates	4.386871	1.359766	0.734064	227,953	735,421	1,362,280
QM7FSDLT5L 24SC 5SB 12/12DM 12/24DH	4.990206	1.553850	0.846534	200,393	643,563	1,181,288
As above summing block failure rates	5.291707	1.644320	0.948267	188,975	608,154	1,054,555
QM7FSDLT5L 12/12DH 5SB 48YC 24ZD	5.786943	1.775954	0.965034	172,803	563,078	1,036,233
As above summing block failure rates	6.192569	1.893478	1.043221	161,484	528,129	958,570
QM7CSDLT5H 12SC 48YC 5SB 12/12DM 24/24DM	4.111724	1.228289	0.696195	243,207	814,140	1,436,379
As above summing block failure rates	4.411583	1.317865	0.839306	226,676	758,803	1,191,460
QM7CSDL 12SC 12SC	1.485432	0.450344	0.254521	673,205	2,220,526	3,928,950
As above summing block failure rates	1.558196	0.471024	0.266234	641,768	2,123,034	3,756,099

Approximating a Configuration

To calculate the approximate the failure rate and corresponding Mean Time Between Failures (MTBF) for a given configuration, at the required temperature, sum the failure rates of all the sub-assemblies. This gives total failures per million hours (FPMH). Convert this to MTBF by dividing 1,000,000 by the total failure rate. See example below:

Example

To approximate the MTBF at 40°C for the configuration: QM7FSDLT5L 12/12DH 5SB 48YC 24ZD

The F in QM7FSDL shows this is a unit with built in fans.

End Cap & Fans	0.786870
1200W Converter	0.164414
Low Power Global Option	0.010031
12/12DH	0.148792
5SB	0.170151
48YC (2×24SC in Series)	0.153305 × 2
24ZD (24SB in parallel with 24SC)	0.153305 × 2
Total failure rate	1.893478
MTBF	$1,000,000 \div 1.893478 = 528,129$ hours

If you require a configuration calculated correctly, rather than the slightly pessimistic approximation given here, please contact Technical Support.

Electrolytic capacitor life calculations

Conditions: 40°C ambient, 100Vac input, 75% loading. Figures in hours

1200W Converter

C10	208,653
C11	475,656
C2	176,676
C7	285,227
C8	267,002
C9	399,128
C13	226,576

DH module

	DH12/12	DH12/24	DH24/24
C207	74,575	73,896	138,431
C204	171,638	192,534	194,432
C210	93,827	140,257	140,257

DM module

	DM12/12	DM4/24
C207	123,974	129,700

SC module

	SC5	SC12	SC24
C205	391,713	529,423	527,205
C206	148,613	498,584	142,108
C207	391,540	532,502	535,502

SB module

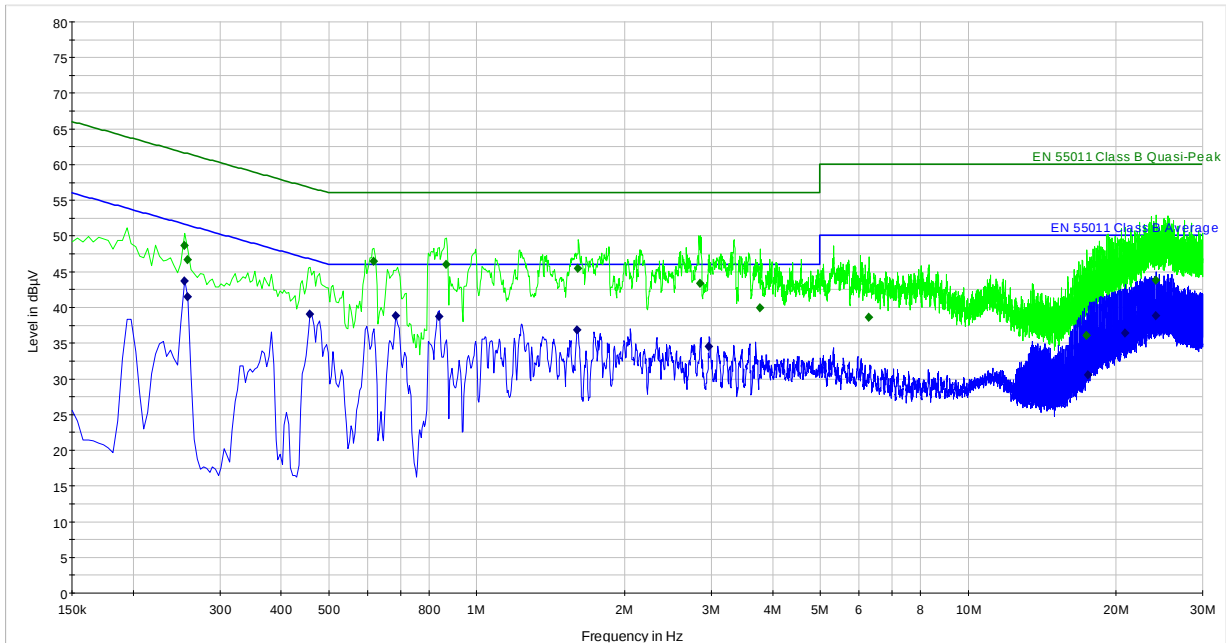
	SB5	SB12	SB24
C205	354,723	137,648	107,596
C206	306,869	110,222	88,562
C207	306,643	110,176	89,852

10. EMC PERFORMANCE

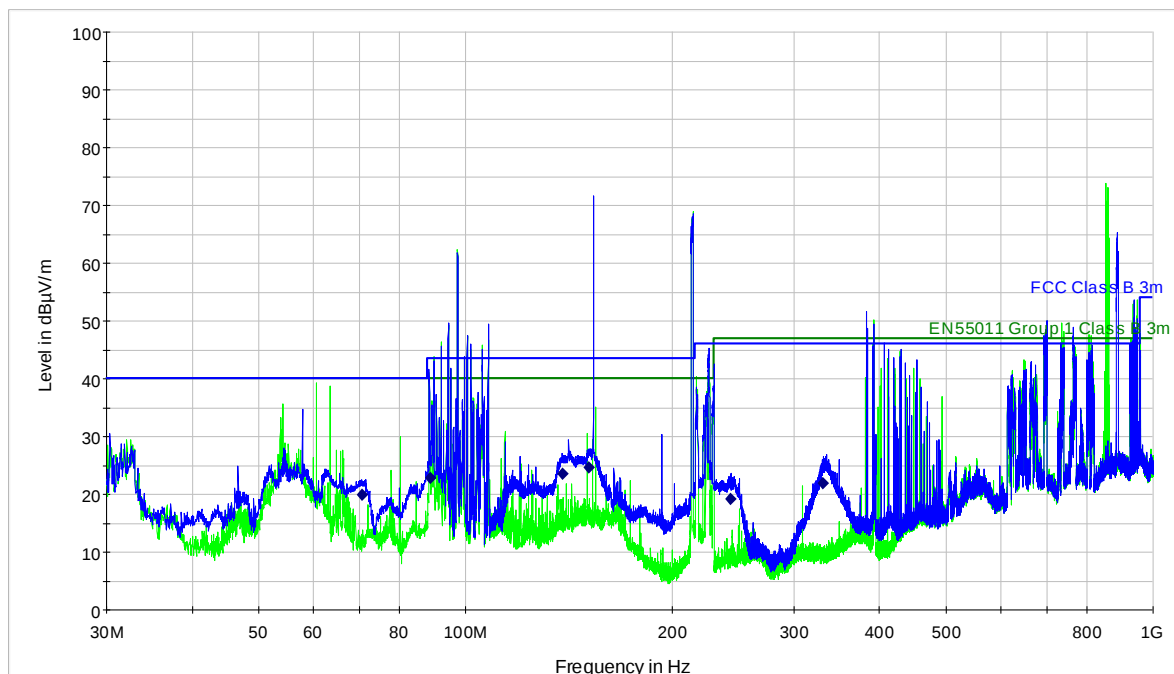
CONDUCTED & RADIATED EMISSIONS RESULT FOR QM7

Configuration with one of each type of module, at 1500W load, 7dB margin to Class B (High line)

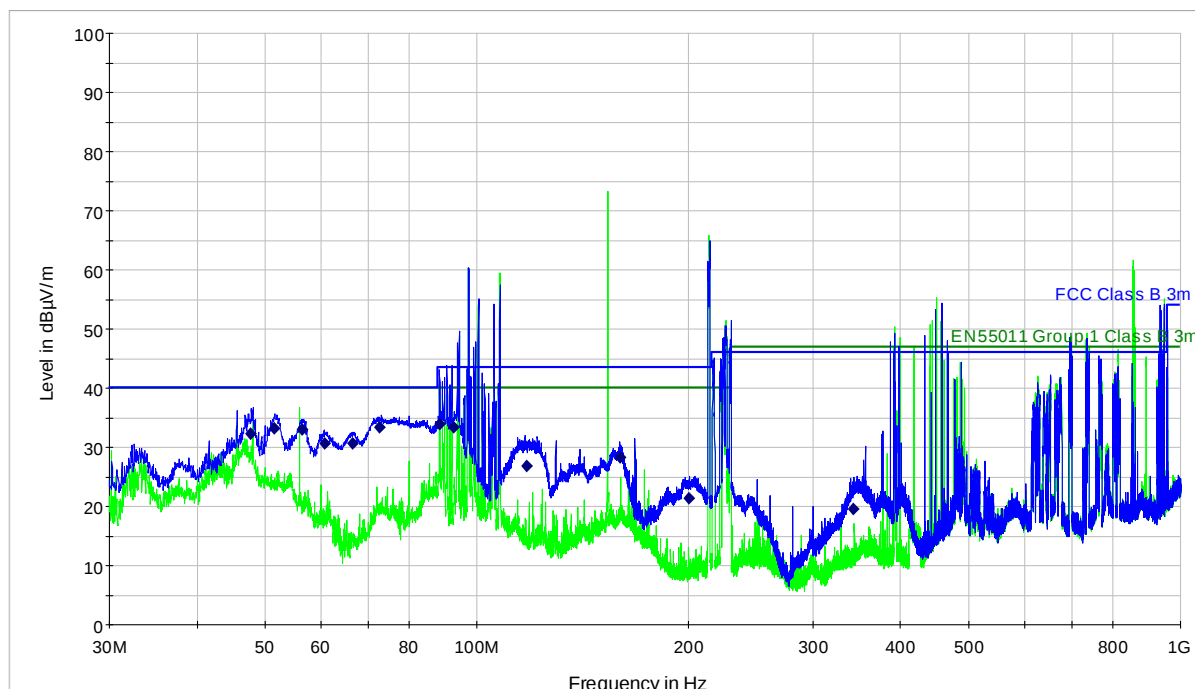
Conducted emissions



Radiated emissions – Horizontal, 15dB margin



Radiated emissions – Vertical, 6.8dB margin



INSTALLATION FOR OPTIMUM EMC PERFORMANCE

Mounting

All equipment ideally should be mounted inside an earthed shielded metal box. Alternatively an earthed metal plate can be used to mount the power supply and load.

Cables

All cables (AC input, DC output, remote sense and signal) should be run as close as possible to the earthed metal box/plane.

AC input cable should be a twisted group laid as flat to the earthed metal box/plane as possible.

Run the remote sense and power output cables as separate pairs twisted tightly together with at least 1 twist per centimetre. Keep separate from the input cables. If the input and output cables must be run close to each other screen one (or ideally both).

All cable run loops should be kept as small as possible (this should be implemented in the system PCB design also).

Connecting between boxes

If cables must be connected between equipment boxes, then at the closest possible point to the port where the cables exit the 1st enclosure connect 100nF decoupling Y caps (between the output and earth). Note that these capacitors must be rated at the working voltage. Ideally these capacitors should be between all signal cables which have to connect between boxes although this may not be practical if fast switching [digital] signals are involved (if this is the case then smaller value Y capacitors should be used).

Earth star point

Where the AC supply enters the equipment, this should be taken to a 'star point' chassis mounted earth point. Ensure wiring and earth grounding methods comply with the appropriate safety standards and National Electrical Codes.

Switching frequencies

	Min kHz	Nom kHz	Max kHz
1200W Converter	106	125	144
1200W Auxiliary supply	82	100	118
HPGO Standby supply	90	100	110
SB Module	70	-	110
SC Module	65	-	100
DM Module CH1	100	-	140
DM Module CH2 – 3.3V	456	518	580
DM Module CH2 – 5V	456	518	580
DM Module CH2 – 12V	204	227	249
DM Module CH2 – 24V	273	307	340
DH Module	100	-	140

Steady state condition

11. MOUNTING

Please refer to Installation Manual for allowable orientations and any possible derating.

Mount using a minimum of four of the threaded mounting inserts.

12. WEIGHT

The QM7 weight is variable determined by the number of modules fitted. From the configuration code select the modules, options and blanking plate(s).

Module	Weight (g)	Notes
Converter & Chassis	1683	Always present
Standby/Signals Option (xxL)	27	
Standby/Signals Option (xxH)	57	
1 Slot Module (DH or DM)	196	
1 Slot Module (SB)	180	
2 Slot Module (SC)	256	
2 Slot Module (YC or ZC)	371	
3 Slot Module (ZD)	446	
4 Slot Module (YF, ZF)	530	
Blanking Plate	5	

13. AUDIBLE NOISE

Measured in accordance with BS EN ISO 3744:2010

(Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure)

The QM7 has two variable speed fans sensing incoming ambient airflow.

QM7F at 25°C 43.6 dB(A)

QM7F at 50°C 57.3 dB(A)

