COOLX3000 OVERVIEW AND GETTING STARTED GUIDE

INTRODUCTION

The CoolX3000 is the latest modular power supply from Advanced Energy and offers system designers the most comprehensive feature set and specifications while delivering best in class performance and unrivalled reliability.

The CoolX3000 is available as either an IEC 63268-1 certified power supply unit for ITE and Audio-Visual applications or as an IEC60601-1 3rd edition & IEC60601-1-2 4th edition (EMC) certified unit for medical applications. The Cs3 is the standard unit which covers ITE and AV while the C3M features medical certification. The CoolX3000 is completely user and field configurable. Outputs can be adjusted to the required set point voltages using onboard potentiometers or digitally via PMBus and can be configured in parallel or series for higher current and/or higher voltages.

A complete power supply is configured by selecting and inserting up to 12 DC output modules into the CoolX3000 unit to build a user defined power supply. This offers the advantages of a custom supply but is assembled from standard and modular building blocks. If output requirements change modules can be reconfigured.

The CoolX3000 features a dual fused input and EMI filtering. Input AC mains voltage (L, N and GND) is applied to a screw terminal input block and then through an EMI filter.

CoolX CoolMods Table				
Single Output Modules (1 Slot)	**Vnom(V)**	**Set Point Adjust Range (V)**	**Imax(A)**	**Power (W)**
CmA	5	2.5-6.0	30.0	150
CmB[1]	12	6.0-15.0[2]	23.3	280
CmC	24	15.0-28.0	12.5	300
CmD	48	28.0-58.0[3]	6.25	300
High Power Modules (3 Slot)				
CmE[4]	24	24-25.2	37.5	900
CmF[4]	48	48-50.4	18.75	900
Dual Output Modules (1 Slot)				
CmG[5] V1	24	3.0-30.0	4.0	120
V2	24	3.0-30.0	4.0	120
CmH[6] V1	5	3.0-6.0	10.0	60
V2	24	3.0-30.0	4.0	120
Wide Trim Modules (1 Slot)				
CmA-W01	5	1.0-6.0	30	150
CmB-W01	12	1.0-15.0[2]	23.3	280
CmC-W01	24	2.0-28.0	12.5	300
CmD-W01	48	3.0-58.0[3]	6.25	300

Figure 1 CoolX3000 Compatible CoolX modules.

OUTPUT CONNECTORS

Module DC Outputs

The CoolX3000 unit is comprised of an outer mechanical chassis containing two individual internal power units and a System Signal Board. These internal power units can be referred to as unit A and unit B, with unit A being the upper power pack and unit B the lower power unit (see Figure 2). The top row of module outputs (unit A modules) will provide voltage polarity as illustrated in fig. 2 with the uppermost output connectors (J1) providing negative DC polarity and the lower output screw connector (J2) providing negative DC voltage. Conversely the bottom-most power unit will provide positive DC voltage from the bottom row of module screw outputs and negative DC voltage from the upper output screws.
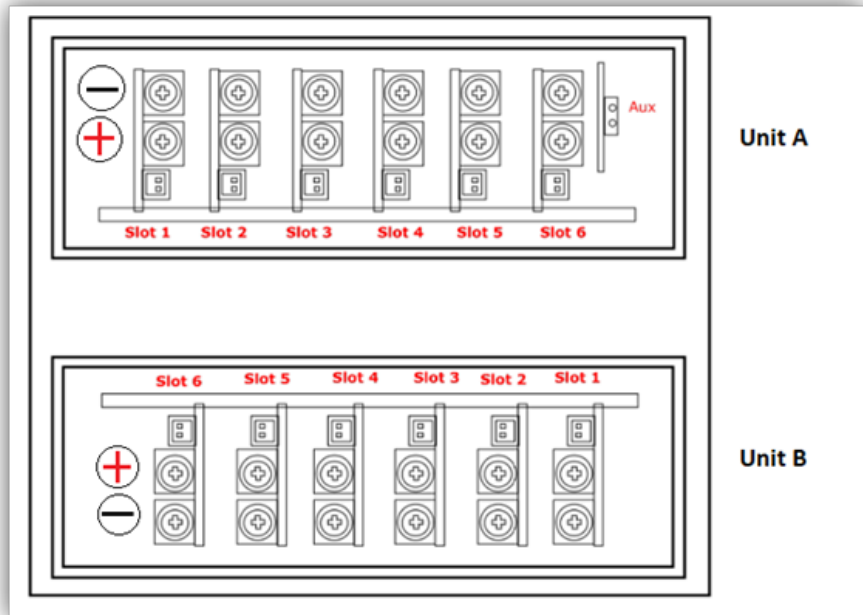

Figure 2

MODULE SIGNAL AND CONTROL CONNECTORS

Each CoolX3000 power module slot has individual signal connectors which can be used to control module power via analogue voltage signals. These module slot signal and control connectors feature control signals such as Power Good, Inhibit/Enable, Vtrim and Itrim. These connectors are designated J1001 to J1006 and exist for both power unit A and power unit B (see fig. 3).See the CoolX3000 designer's manual for more details.

CoolMod Enable/Inhibit
Each CoolMod may be enabled/inhibited by means of a logic level signal applied to the enable input on Output Signal Connector J1001-J1006.

CoolMod Power Good Signal (Standard, Wide-Trim and Bulk modules)
Each CoolMod has a Power Good signal that is the output of an internal comparator which monitors the output voltage and determines whether this voltage is within normal operation limits.

Remote Voltage Adjustment
The output voltage of the CoolMod can be set by applying a control voltage Vtrim across the

Output Signal Connector pins Vtrim (Pin 6) and Common (Pin 1). The Vtrim voltage required for the users desired output voltage can be calculated using a formula and table found in the CoolX3000 designer's manual.

Current Limit Programming

The current limit of the CoolMod can bet set by applying a control voltage Itrim across the Output Signal Connector pins Itrim (Pin 5) and Common (Pin 1). The Itrim control voltage required for to set current limit can be calculated using a formula and table found in the CoolX3000 designer's manual.

Consult the CoolX3000 designer's manual for further details on the use of module control signals. Some modules do not feature a full set of control monitor signals.

GLOBAL SIGNAL CONNECTORS

Global Power Good

A Global Power Good signal is activated when all enabled CoolMods report individual Power Good for their outputs.

Global Inhibit/Enable (CONTROL)

All CoolMod outputs may be enabled/inhibited simultaneously by means of an appropriate signal applied to the CONTROL input onJ11, between Pin 3 (Control) and Pin 1 (Common).

Global Enable Logic

Header J13 is the signal board reverse polarity header and a jumper placed appropriately on J13 pins will determine the polarity of the Global enable function of the CoolX3000 power pack. When polarity is reversed a logic level low must be applied to the control pin of J11 to globally enable or inhibit modules. The modules will then be turned off by default. The recommended jumper for the J1011 and J13 connectors is a Harwin M22-1900005 2mm Jumper Socket.

Over Temperature Protection

If an Over Temperature condition is detected, the OTP signal will be pulled low as a pre-warning of a possible shutdown of the power supply. If the OTP condition persists for a further 2 seconds, the CoolX3000 will shut down. The CoolX3000 will auto recover when temperatures reach normal operating level.

AC Fail

The CoolPac AC Fail Signal indicates that the input voltage has failed or has dropped below 70 VAC.

Consult the CoolX3000 designer's manual for further details on the use of global control signals. Some modules do not feature all control monitor signals.

PMBus and Global Monitoring

The CoolX3000 signal board which connects the two power units features two further connectors, J13 and J11. Connector J11 can be used to access the CoolX3000 PMBus features (See PMBus Overview or CoolX3000 designer's manual online for full details.) as well as providing pins for monitoring AC Fail, OTP , Fan Fail , and Power Good signals. A Global Enable function is also provided by applying the correct voltage the Global_EN pin of J11. See the CoolX3000 designer's manual for more details.

Aux Supply

A single Aux Output Connector J1 provides a 24W auxiliary 'always-on' isolated bias supply of 12VDC or 5VDC (optional) provided from the upper power pack for peripheral use. This Bias supply has medical isolation of 4000VAC (2 MOPP).
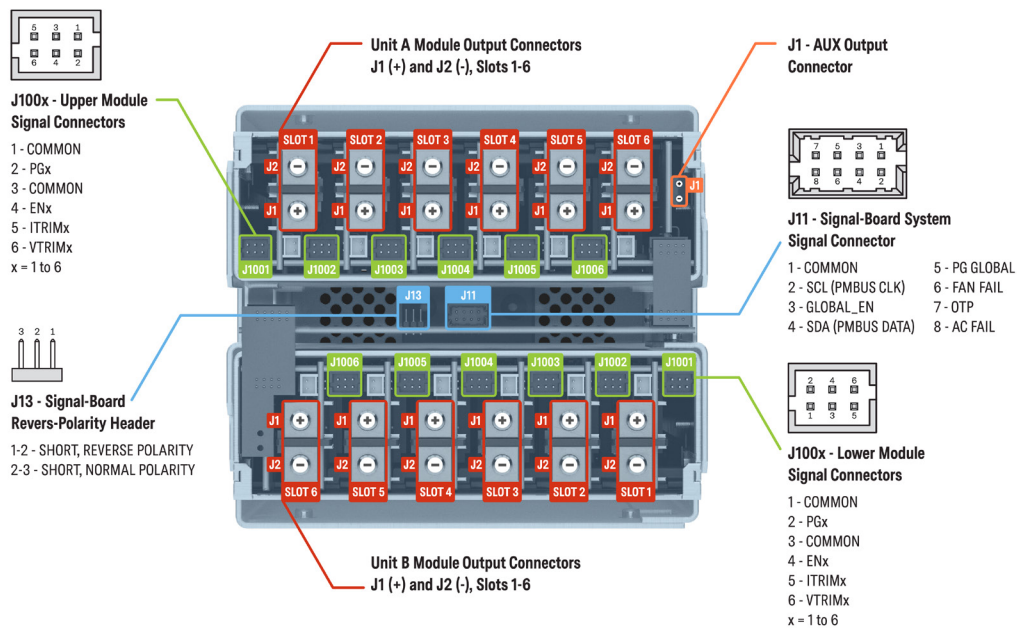

Figure 3

PMBus Overview

PMBus is an open standard which defines a means of communication for power conversion devices. It defines a full set of commands and data structures required by power control and management components. The CoolX Series PMBus interface facilitates the communication of operating parameters such as output voltage, output current and internal temperature with other PMBus enabled devices. It also facilitates the remote adjustment of parameters such as output voltage level, current limit and enable status. A full suite of monitoring and controls including AC Fail, Global Inhibit/Enable, Over-Temperature Alarm and a PmBus interface are provided.

Pins 2 (SCL) and 4 (SDA) of connector J11 are used for synchronizing and transmitting or receiving data via PMBus.

Advanced Energy

SDA: Serial Data Line

This is the data line over which all serial communication takes place. It is essential that this pin is connected to the PMBus SDA line. This is an open collector pin which should be pulled up to 5V by the PMBus host device.

SCL: Serial Clock Line

This is the clock line which synchronizes all serial communication over the PMBus. It is essential that this pin is connected to the PMBus SCL line. The CoolX Series PMBus interface is designed to operate with a PMBus clock frequency of 100KHz. This is an open collector pin which should be pulled up to 5V by the PMBus host device.

J13 - Signal-Board Revers-Polarity Header

1-2 - SHORT, REVERSE POLARITY

2-3 - SHORT, NORMAL POLARITY

J11 - Signal-Board System Signal Connector

1 - COMMON
2 - SCL (PMBUS CLK)
3 - GLOBAL_EN
4 - SDA (PMBUS DATA)
5 - PG GLOBAL
6 - FAN FAIL
7 - OTP
8 - AC FAIL
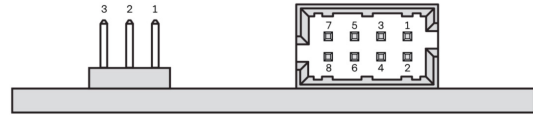
Figure 4: Connector J11 : SDA and SCL are used for sending and receiving PMBus data.

The CoolX Series PMBus interface allows the user to modify the lower 4 bits of the slave address of each power unit by modifying jumpers on the J1011 connector. Each internal power unit (unit A and unit B) features its own J1011 connector which can be accessed when the modules are removed. See CoolX3000 designer's manual for more details.

Monitoring Commands	Control Commands	Identification Commands
VOUT_MODE	PAGE	MFR_ID
READ_VOUT	OPERATION	MODULE_ID*
READ_IOUT	VOUT_COMMAND	MFR_MODEL
READ_TEMPERATURE_1	ILIMIT_TRIM*	
STATUS_WORD	PMBUS_STANDBY	
READ_VIN		

Figure 5: CoolX PMBus Commands. *ILIMIT_TRIM and MODULE_ID are manufacturer specific.

Each internal power unit (upper unit 'A' and lower unit 'B') is addressed separately by PMBus. Unit A should be addressed using the PMBus address 0xA0 while unit B should be addressed using the PMBus address 0xA2. In order to send control and monitoring commands to modules it is necessary to use the relevant power unit address. See CoolX3000 designer's manual for more details.

Derating

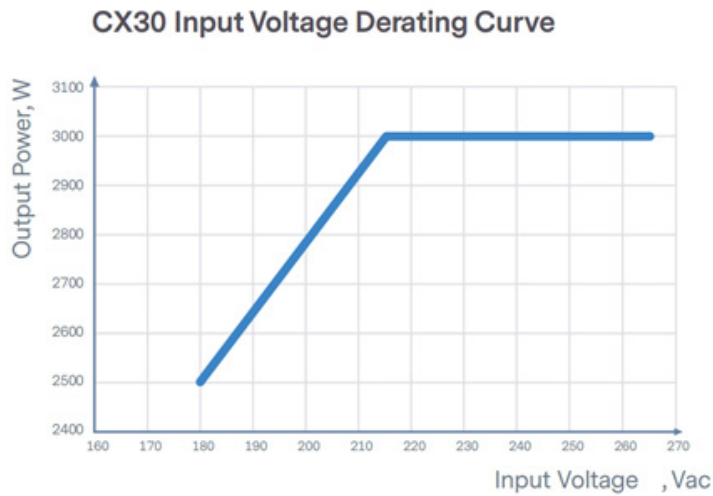Derating note: The CoolX3000 can supply 3KW at 220 Volts and above.

Figure 6: Input Derating

Parallel Operation

Modules can be connected in series or parallel for higher voltage or current. CoolX3000 power packs can also be connected in series or parallel for higher voltage or current respectively. A 10% power derating applies to modules configured in parallel while power supply packs connected in parallel must also be derated by a further 10% High power CmE and CmF modules cannot be configured in parallel or series in a single CoolX3000 power pack or across units. See the CoolX3000 designer's manual for further information.