# PET2000-12-074NA

# SINGLE CONNECTOR BOARD

P/N: YTM.00046.0

PCB version ZGN.U0P03.1

## User Manual

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## 1. INTRODUCTION

This user manual is for the PET2000-12-074NA Single Connector Board (YTM.00046.0).

PET2000-12-074NA Single Connector Board is intended for evaluation and testing of a single Platinum Front-End power system for Datacom servers, routers, and switches.

## 2. SAFETY WARNING

This evaluation board is intended for use for ENGINEERING DEVELOPMENT, DEMONSTRATION, OR EVALUATION PURPOSES ONLY and is not considered by Bel Power Solutions to be a finished end-product fit for general consumer or professional use. Persons handling the product(s) must have electronics training and observe good engineering practice standards. As such, the goods being provided are not intended to be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including product safety and environmental measures.

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THE ON-BOARD USB TO I2C INTERFACE IS NOT GALVANIC ISOLATED (see page 7, TEST SETUP for further information).

## 3. REFERENCE DOCUMENTS

| | |
|---|---|
| BCD.00478 | PET2000-12-074NA Datasheet |
| URP.00234 | PETxx00-12-074NA Communication Manual |

## 4. YTM.00046.0 CONTENT

PET2000-12-074NA Connector Board

USB Cable A-B

## 5. SPECIFICATION

General Condition: TA = 0 … +55 °C unless otherwise noted.

| PARAMETER | | CONDITIONS / DESCRIPTION | MIN | NOM | MAX | UNIT |
|---|---|---|---|---|---|---|
| $V_1$ | Main output voltage | | | 12 | | VDC |
| $I_{1\ nom}$ | Nominal output current | | | | 167 | A |
| $V_{SB}$ | Standby output voltage | | | 12 | | VDC |
| $I_{SB\ nom}$ | Standby output current | | | | 5 | A |
| | Communication | PMBUS Protocol | | $I^2C$ via on-board USB converter | | |

## 6. DESCRIPTION

The single connector board provides all necessary electrical connections on the output power and signals of the PET2000-12-074NA front-end power supplies with communication capabilities.

It also provides test points so that specific voltages and signals can be monitored.

Adding or removing jumpers allow configuration of certain functions of the power supply.

Operating the connector board at high load for long duration (more than 5 minutes) requires some kind of cooling of the board to ensure its temperature remains in a range not dangerous when touching.

### Evaluation Board Schematic

The schematic of the single connector board can be found in Appendix A.

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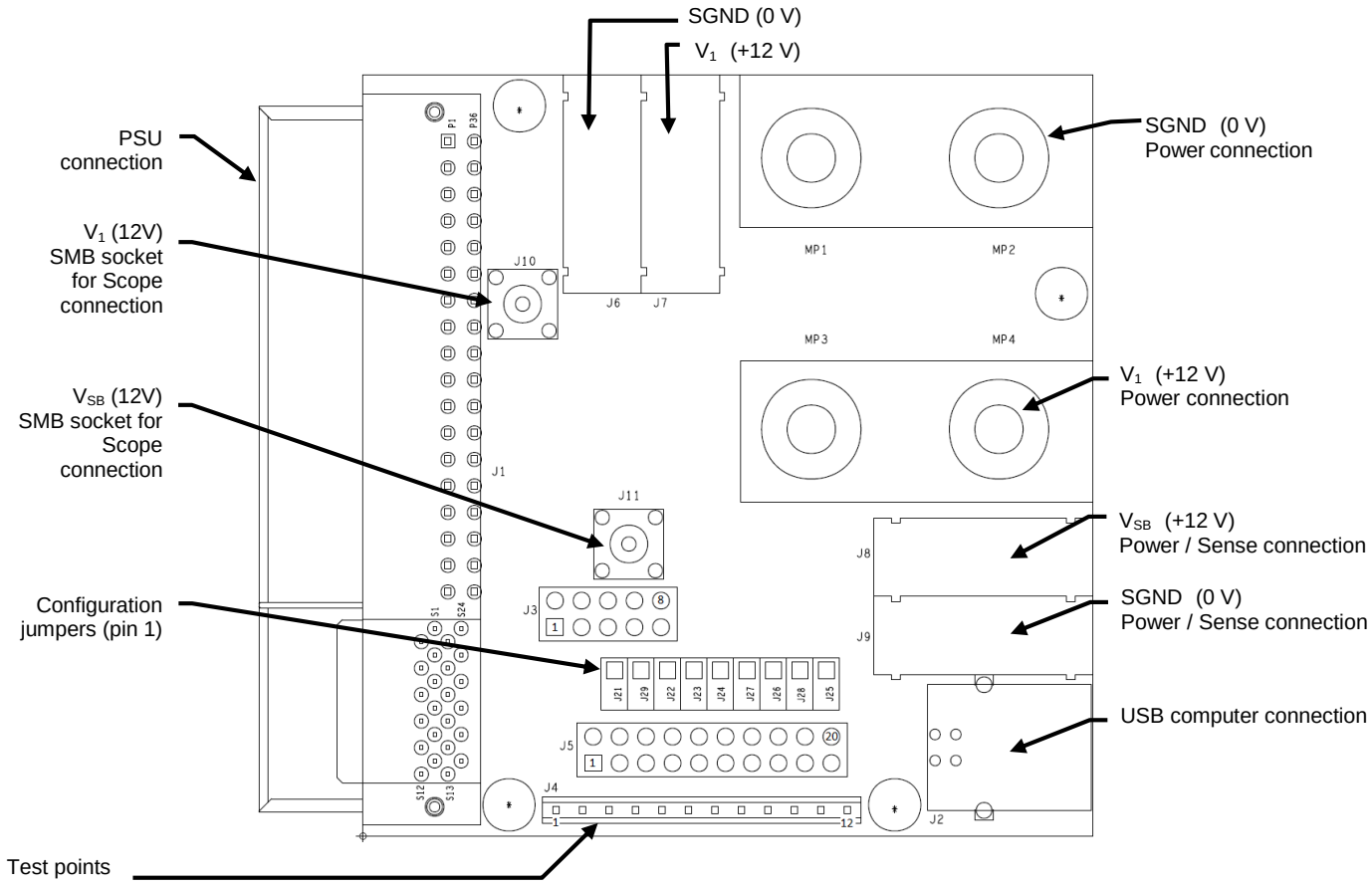
### Evaluation Board Assembly Drawing

Use metric M5 screws to attach power cables to MP1 … MP4. Use at least 35mm2 cable to connect to load.



### Test Points and Connectors

Measurement Connectors and Test Points

| CONNECTOR | NAME | DESCRIPTION | NOTES |
|---|---|---|---|
| MP3, MP4 | V1 | 12V main output | Main output load connection |
| MP1, MP2 | GND | Main output return | |
| J7 | V1 | 12V main output | Use to sense main output voltage, or low current load max. 16A |
| J6 | GND | Main output return | |
| J8 | VSB | 12V standby output | Standby output load and sense connection |
| J9 | GND | 12V standby return | |
| J4 pin 1 | PSON_L | Power supply on input, active-low | |
| J4 pin 2 | PWOK_H | Power OK signal output, active-high | |
| J4 pin 3 | SMB_ALERT_L | SMB Alert signal output, active-low | |
| J4 pin 4 | SCL | I2C clock line | |
| J4 pin 5 | SDA | I2C data line | |
| J4 pin 6 | HOTSTAND-BYEN_H | Hotstandby enable signal, active-high | |
| J4 pin 7 | PRESENT_L | Power supply seated, active-low | |
| J4 pin 8 | A2 | I2C address selection input | |
| J4 pin 9 | ISHARE | Analog current share bus | |
| J4 pin 10 | V1 | Main output sense | |
| J4 pin 11 | VSB | Standby output sense | |
| J4 pin 12 | GND | Signal return/reference | |
| J5 | Bridge these pins through flat cable to any paralleled PET2000-12-074NA evaluation board | | |
| J10 | V1 | 12V main output | Use for scope connection |
| J11 | VSB | 12V standby output | |
| J2 | USB | USB connection to computer | |

### Jumper Configuration

| JUMPER | NAME | DEFAULT | JUMPER | DESCRIPTION |
|---|---|---|---|---|
| J21 | V1_SENSE | Present | Open | Positive main output sense input of PSU is open, and can be manually connected through J21 pin 1, or by connecting to a paralleled evaluation board |
| | | | Present | Positive main output sense input of PSU is connected to V1 power rail |
| J22 | V1_SENSE_R | Present | Open | Negative main output sense input of PSU is open, and can be manually connected through J22 pin 1, or by connecting to a paralleled evaluation board |
| | | | Present | Negative main output sense input of PSU is connected to GND power rail |
| J23 | A0 | Present | | |
| J24 | A1 | Present | | |
| J29 | A2 | Present | | |

| J29 (A2) | J24 (A1) | J23 (A0) | Controller address | EEPROM address |
|---|---|---|---|---|
| Present (Low, Default) | Present (Low) | Present (Low) | 0xB0 | 0xA0 |
| | | Open (High) | 0xB2 | 0xA2 |
| | Open (High) | Present (Low) | 0xB4 | 0xA4 |
| | | Open (High) | 0xB6 | 0xA6 |
| Open circuit (High) | Present (Low) | Present (Low) | 0xB8 | 0xA8 |
| | | Open (High) | 0xBA | 0xAA |
| | Open (High) | Present (Low) | 0xBC | 0xAC |
| | | Open (High) | 0xBE | 0xAE |

| | | | | |
|---|---|---|---|---|
| J25 | PSON_L | Present | Open | PSON_L input of PSU is only pulled low in case the microcontroller is pulling it low as commanded through USB |
| | | | Present | PSON_L input of PSU is pulled to GND, main output is always enabled |
| J26 | SDA | Present | Open | SDA line of PSU is left open, and could be manually connected through J4 pin 5, or by connecting to a paralleled evaluation board |
| | | | Present | SDA line of PSU is connected to I2C-to-USB conversion microcontroller |
| J27 | SCL | Present | Open | SCL line of PSU is left open, and could be manually connected through J4 pin 4, or by connecting to a paralleled evaluation board |
| | | | Present | SDA line of PSU is connected to I2C-to-USB conversion microcontroller |
| J28 | Pull up | Present | Open | Pull up voltage for SMB_ALERT_L pull up resistor can be manually connected on J28 pin 2 |
| | | | Present | Pull up voltage for SMB_ALERT_L pull up resistor is set to 3.3V generated from 5V which are supplied by connected USB |

**NOTE:**
The PSU device address will be calculated once during the Power-Up cycle, any change to the address jumper will be ignored until a complete Power-On-Reset occurs.

## 7. TEST SETUP

**WARNING:** The USB interface is NOT galvanic isolated, its GND is referenced to the PSU output GND pins.
Within the power supply the GND pins are connected to PSU chassis and PE pin of the AC inlet.
If a Desktop Computer is being used, there is a risk of generating an earth loop!
A scope used to measure signals / output must always reference the scope probes to GND pins!

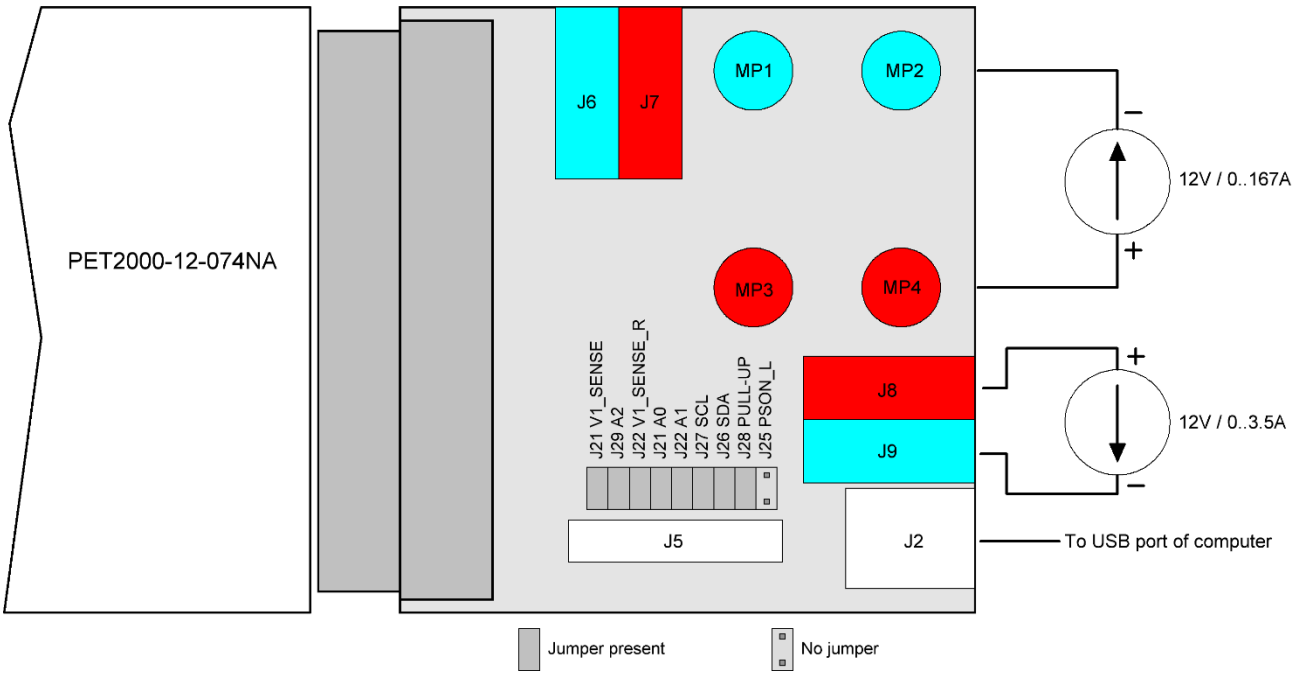
| TEST EQUIPMENT | SPECIFICATION |
|---|---|
| AC Source | AC mains 100 .. 240 VAC or AC electronic source capable of at least 2.5 kW / 5 kW in parallel configuration |
| DC Load V1 | 12 VDC / 167 A or 334 A in parallel configuration |
| DC Load VSB | 12 VDC / 5 A |
| USB Communication | USB A-B cable connected to Laptop computer |

### Single Power Supply

In this configuration all jumpers J21..J29 should be present except J25; this allows correct remote sense in an internal point in the adapter board, I2C communication through USB interface, I2C address set 0xB0 (Controller) and 0xA0 (EEPROM), and SMB_ALERT_L having 3.3 V pull up voltage.

Regulated output voltage (i.e. 12.00 V ± 0.5 % at 50 % of the total load) is set in an internal point of the evaluation board.

NOTE: The main output V1 of the PET2000-12-074NA will only turn on if the USB cable is plugged into a powered USB port (else PSON_L is not pulled low) or if jumper J25 is set (PSON_L always pulled low).

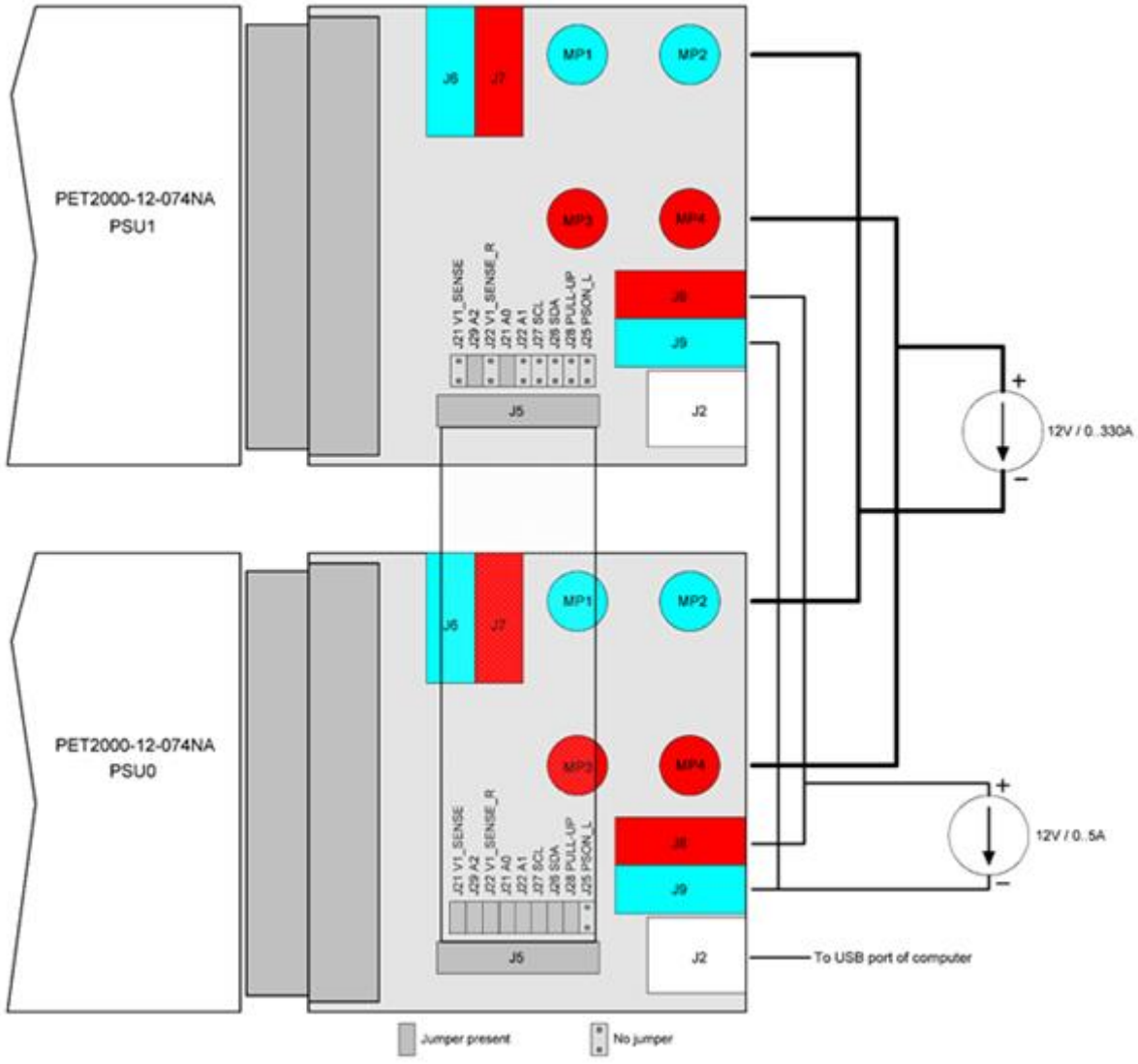


### Two Power Supplies in Parallel

In order to have correct parallel operation the connectors J5 of both Evaluation Boards need to be interconnected. This can be easily done by a 20 pin 1.27mm pitch flat cable with 2.54mm pitch female headers attached to both ends. This way the I2C lines, the ISHARE bus, both sense lines, PSON_L, HOTSTANDBYEN_H plus pull-up voltage SMB_ALERT_L are shared between the two Evaluation Boards.

The jumper position has to be set as shown in following pictures. The Evaluation Board with USB attached (connected to PSU0) has still the same jumper setting as in single power supply configuration. The paralleled one (connected to PSU1) needs to have jumpers removed as shown. This way PSU1 gets the I2C lines, the PSON_L and the pull-up voltage for SMB_ALERT_L from Evaluation Board attached to PSU0. The jumper for I2C address configuration must be different on the two Evaluation Boards, in below example PSU0 has A[2..0] set to 000, while PSU1 has A[2..0] set to 001.

Regulated output voltage (i.e. 12.00 V ± 0.5 % at 50 % of the total load) is set in an internal point in the PSU0 adapter board, while PSU1 gets the output voltage sense information.

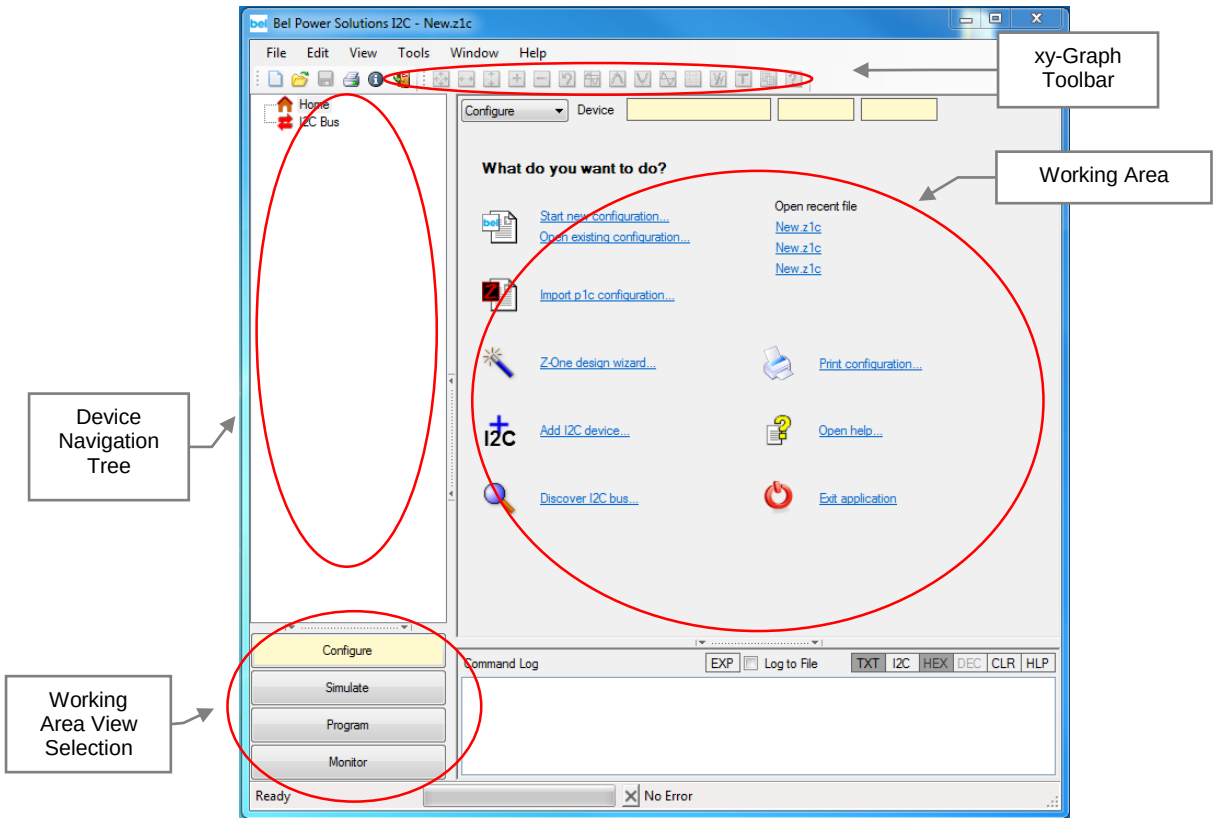


## 8. SOFTWARE SETUP

The latest “Bel Power Solutions I2C GUI” software can be downloaded from www.belpowersolutions.com. The downloaded archive contains a user guide (including installation steps) and an installer (BPS_I2C_GUI_x_x_x.exe) that will guide you through the installation process of the GUI.

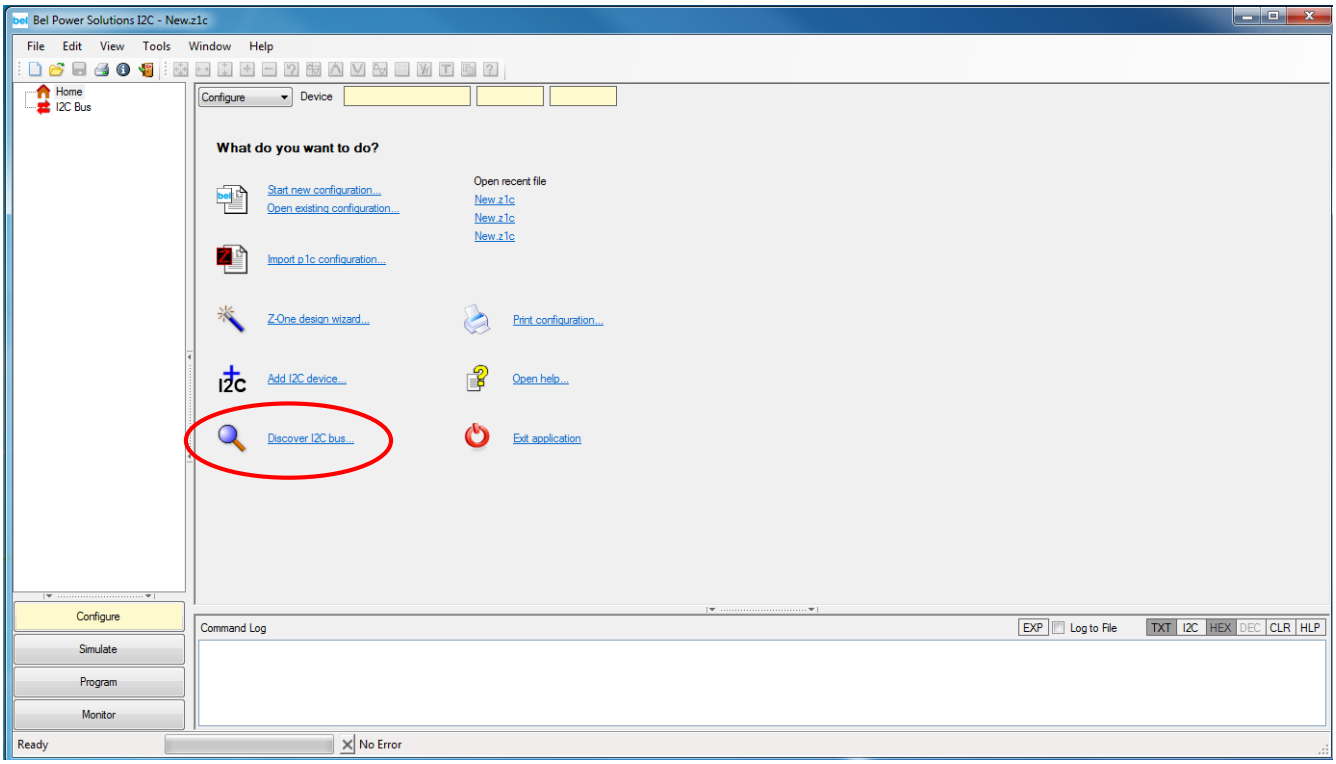
**NOTES:**

- The GUI uses Microsoft .Net 2.0 framework to display dialogs and other built in utilities. If the .Net framework is not installed on your computer, the installer will guide you through the download and installation of the framework before the GUI is installed.
- Make sure that you have Internet connection when installing the GUI, else the framework cannot be downloaded (if necessary) and the installation will fail.
- During the installation the driver to communicate over the I2C bus gets pre-installed. Click “Continue anyway” to pre-install the driver.
- The installer may request to re-start the computer.
- Once the GUI is installed, plug in the USB-I2C Converter. Windows will recognize the new hardware and ask to finish the installation. Once the Computer has reported „Found New Hardware“ the software installation wizard will automatically pop up. Allow Windows to search for the software and select „Install software automatically (Recommended)“. Again click “Continue anyway” to finish the driver installation. Note: this step may not pop up.
- Launch the GUI by double clicking the “Bel Power Solutions I2C GUI” icon on the desktop ( ) or launch the GUI via the Windows Start Menu.



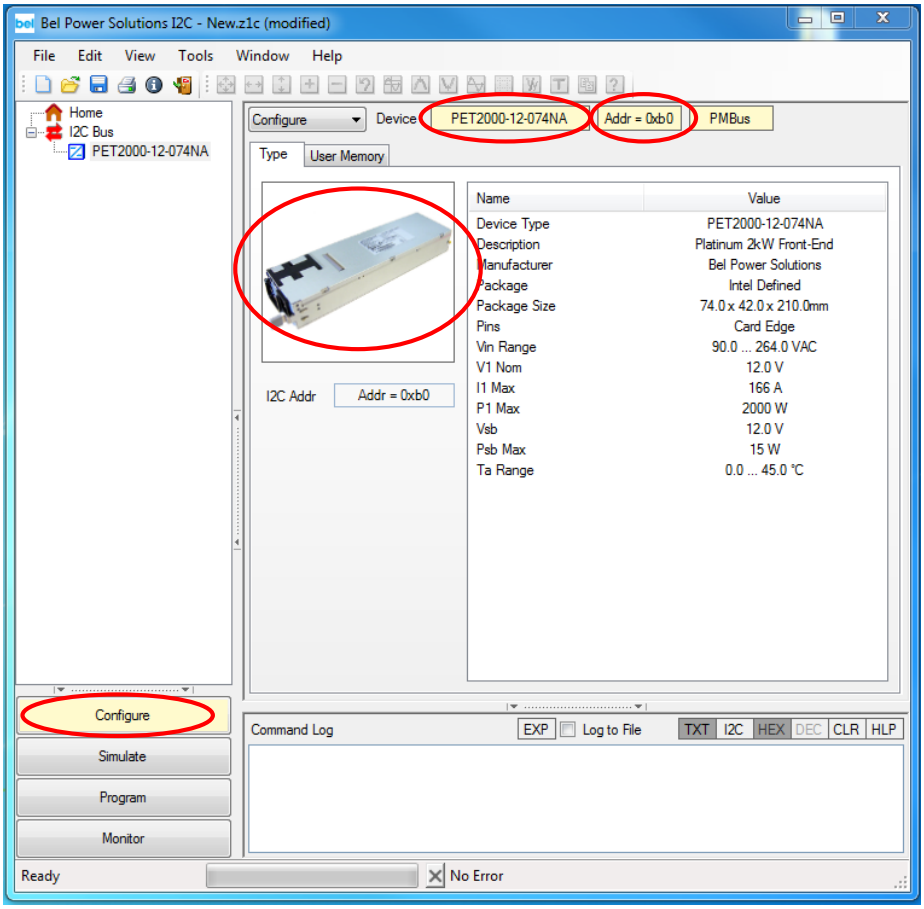
## 9. OPERATION

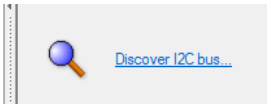
1. Test setup according to chapter 1.
   a) AC not yet applied to PSU(s).
   b) DC Loads connected.
   c) USB port connected to laptop.
2. Verify that the LED1 on the connector board is blinking (supplied by USB interface).
3. Turn-on AC source or connect AC mains.
4. Verify that PSU LED is green.
5. Set load to desired values.
6. Start the GUI on the Laptop
   a) In the Home screen click “Add I2C device…”




b) On the Add I2C Device dialog, click “Category” and select PET. Then click on “Device” and select PET2000-12-074NA. Press “Add”, once the process is completed, the GUI should show the identified power supply on the bus (see c)).

c) Verify that the power supply has been identified correctly. PMBus communication is initially fixed to address 0xb6. Adjust I2C address according to the A1/A0 jumper settings on the Evaluation Board.



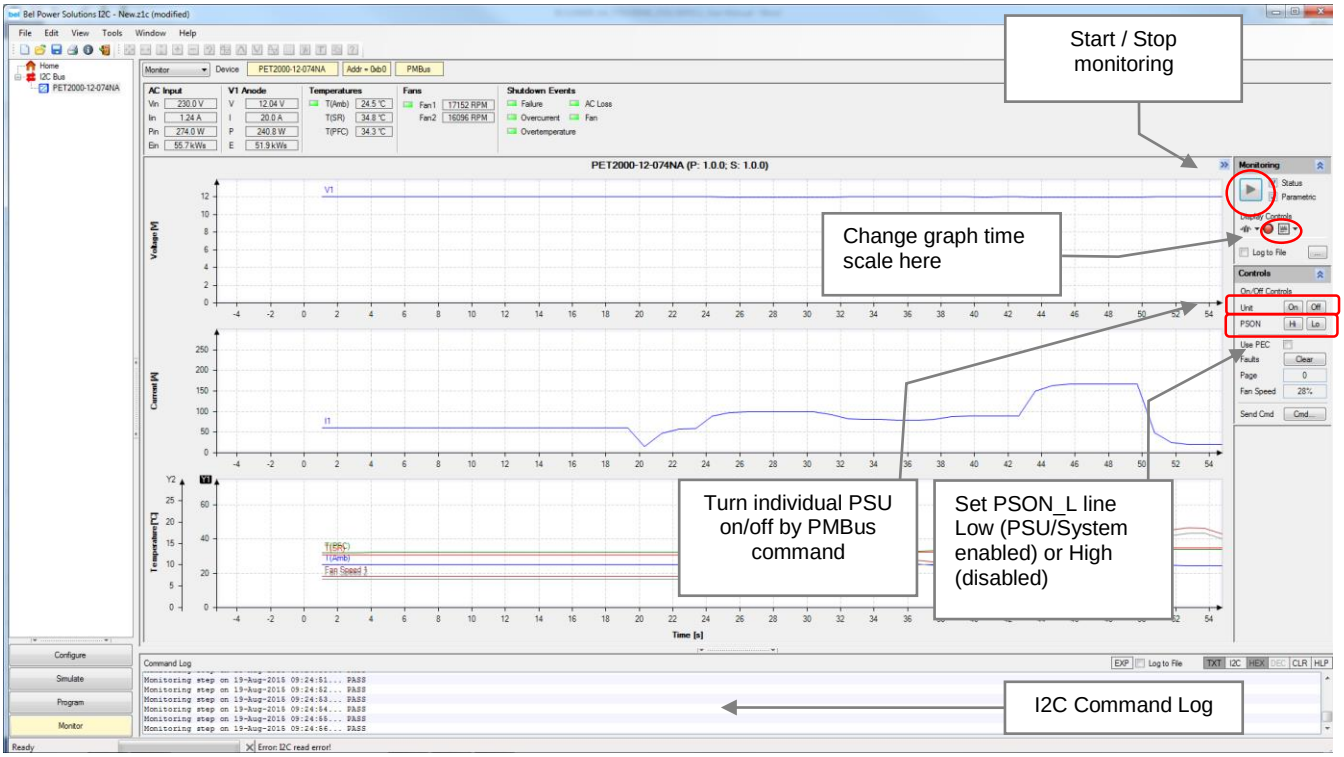




Alternatively select “Discover I2C bus..” and let the GUI search for units connected to the I2C bus. Every powered unit on the bus will be prompted on the Device Navigation Tree.

d) Switch to the Monitor View by clicking the Monitor button on the left bottom, or by pressing ‘Alt-m’, or by choosing View/Monitor in the main, or by selecting monitoring in the dropdown list-box. This opens the monitoring view of the PET2000-12-074NA power supply.

e) In the monitor view click the ► button to start the monitoring process. Click the ■ button to stop the monitoring process.

f) In the monitor view click the Unit On/Off button to turn-on/off the monitored unit (chosen in the device navigation tree). Click the PSON On/Off button to turn-on/off all PSU connected to the PSON_L signal.

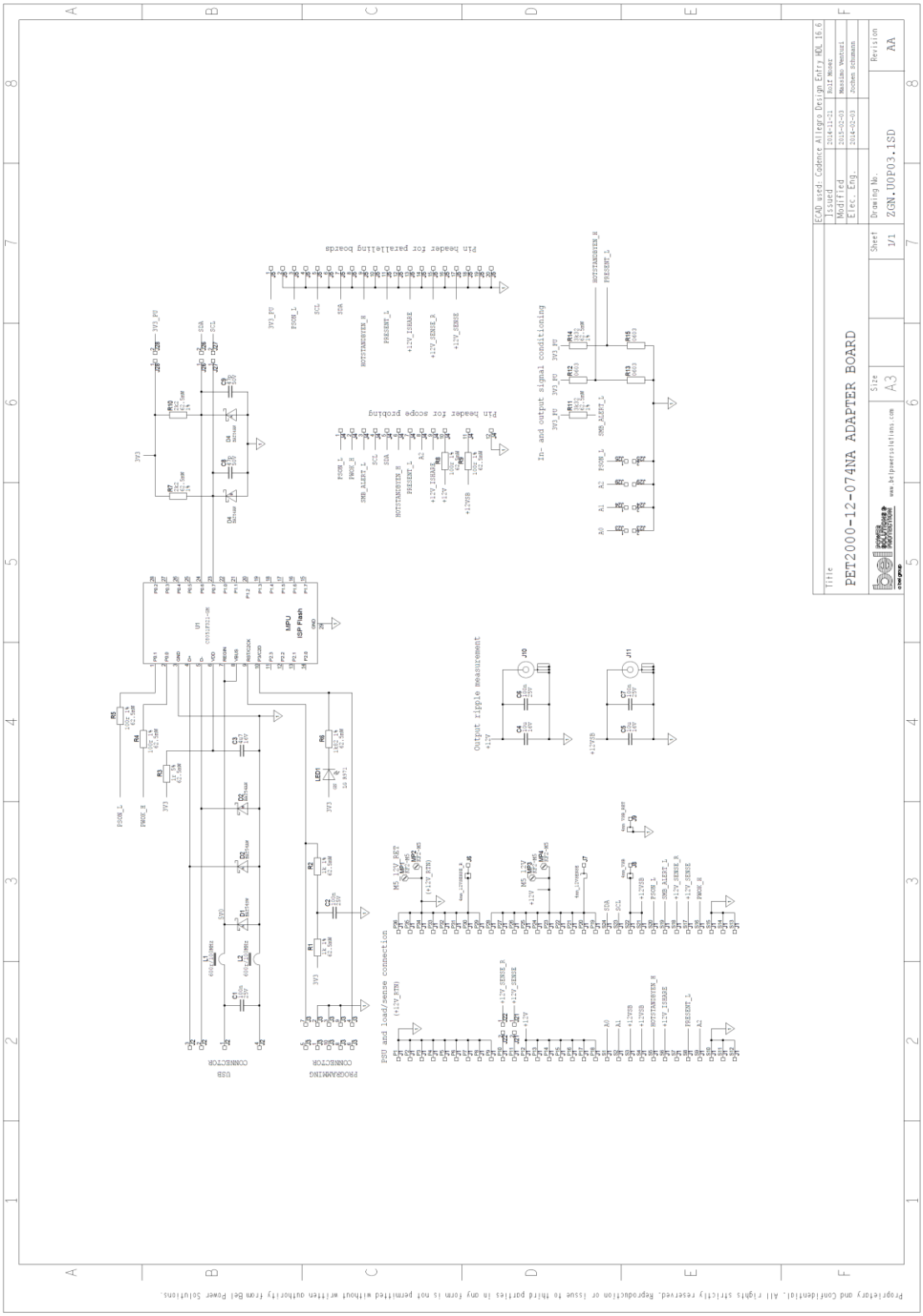



If using two PET2000-12-074NA in parallel simply repeat step 6, and set I2C address according to jumper setting on the paralleled board. Note the parallel setup as shown in chapter 1 must be followed.

## 10. HISTORY

| REVISION | DESCRIPTION | DATE | AUTHOR |
|---|---|---|---|
| 001 | Initial Draft | May 22, 2014 | U. Wild |
| AA | Added pins PRESENT_L and A2 | Aug 18, 2014 | U. Wild |
| AB | Updated for PCB ZGN.U0P03.1, Parallel operation test setup and new GUI print screen pictures | Aug 19, 2015 | J.Schaerer, G.Parrino |

## Appendix A: Schematic YTM.00046.0 Evaluation Board



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