ELTEK
A Delta Group Company

Installation Guide

I/O Monitor2

CAN Bus Node

Power Supply Systems

Generic Applications (T2)

351509.033

356800.183, 3v5

SAFETY and ENVIRONMENTAL PRECAUTIONS

The **product warranty** becomes invalid if the following safety precautions are not followed during handling, installation, commissioning and general use/operation of *Eltek* power supply systems.

General Precautions


Device Hazard

G1 **CAUTION:** Even though the product incorporates protection circuitry and other safeguards, it can be **damaged, perform poorly or have a reduced lifetime** if it is exposed to **incorrect treatment** during transport, installation or service. Always handle the equipment using proper lifting techniques, do not roll, climb or drill hole in the cabinets or enclosures.


Electric Shock

G2 **WARNING: Opening the equipment may cause terminal injury — even if the mains AC supply is disconnected. Hazardous voltages may be present inside, as large capacitors may still be charged.**

Environmental Precautions


Ventilated Hot Surface

E1 **CAUTION:** To avoid damage the equipment, **keep objects clear of system ventilation inlets, outlets and system fans**, if any, ensuring the **airflow** through the units is **not obstructed**, and that the fans rotate freely. Use caution with power modules, as they can reach **extreme temperatures** under load and normal operation.


Current Surge Protection

E2 **WARNING: The installer/user is responsible for ensuring that the power system is not damaged by current surges, over-voltages, etc. caused by external transients, lightning, electrostatic discharge, etc. To avoid damage and obtain the expected system reliability, it is mandatory to always install SPDs in Eltek's power supply systems. Follow the instructions given in "Guidelines for Lightning and Surge Protection", doc. 2024623**.


Humidity & Dust Protection

E3 **WARNING: The electronics in the power supply system are designed for indoor, clean environment. When installed in outdoor enclosures — using heat sinks or closed loop heat management systems — it is important to maintain the equipment closed and tight during operation, to avoid external air entering the enclosure. Also, when using open loop heat management systems, it is important to replace the filters on a regular basis. Indoor installations in dusty or humid areas require appropriate air filtering of the room, or filtering of the air entering the power system. Follow the instructions given in "Generic Guidelines Environmental Protection.", doc. 2038879**

Precautions during Installation


Qualified Personnel

I1 **CAUTION: Read the user documentation carefully** before installing and using the equipment, as installation and operation is to be performed as described in it. Always tighten screws and bolts with the **torque values recommended** in the documentation. For safety reasons, the **commissioning and configuration of the equipment is only to be performed** by *Eltek*'s personnel or by authorized and qualified persons.


EMC, NEC/CEC Regard

I2 **CAUTION:** This product is tested and verified according to international safety, environmental and EMC standards. Any **non-*Eltek* equipment** installed into this product after delivery might influence the performance and **could infringe the original approvals**. The **installer is responsible** for ensuring that the environmental properties of this product/ system do not deteriorate during installation, and that it is performed in accordance with applying regulations.

Installations in USA and Canada must comply with NEC/CEC requirements.


Device Hazard

I3 **CAUTION:** Before you start the electrical installation, you must **always disconnect** all external supply fuses, as well as internal battery and load fuses/ breakers, if any.


Electric Shock

I4 **WARNING: For safety reasons (high leakage current / high touch current) you must always connect the AC earth wire (PE) to the terminals, before you connect the AC input cable(s).**

The batteries, if any, represent a major energy hazard. To avoid short-circuit of battery poles, you must always remove metallic objects — uninsulated tools, rings, watches, etc. — from the vicinity of the batteries.


Electric Shock

I5 **WARNING: 60V power systems, and higher voltage systems, are only to be installed in Restricted Access Locations (RAL). Access must be limited by use of tool, i.e. lock and key.**

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Certificate No. 4072-2007-AQ-NOR-NA

I/O Monitor Types			
Part Number	**Type**	**Description**	**Installation Guide**
242100.304	I/O Monitor	Type 1 (T1), for Outdoors applications	351503.033
242100.502	I/O Monitor2	Type2 (T2), generic unit without the Outdoor functions	351509.033 (this guide)
242100.306	I/O Monitor3	Type3 (T3), similar to Type 1 but with support for Solar hybrid functions (fuel tank and wind measurements, etc)	351503.033
242100.603	FlexiMonitor	Type 5 (T5), multipurpose I/O monitor that can be used instead of T1*, T2 & T3*	351535.013
242100.604	Expansion Kit	Relay Expansion Kit, 8 relays	
242100.605	Expansion Kit	Relay Expansion Kit, 4 relays	
242100.606	Expansion Kit	LED Panel Expansion Kit	

* Note that FlexiMonitor supports no fan control functionality

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Table of Contents

1. Introduction

Congratulations on your purchase of the *I/O Monitor2 CAN Bus Node*, an intelligent "plug-and-play" module used to decentralize and expand the functionality of your power supply system.

About this Guide

This booklet provides you with the required information for installing the *I/O Monitor2 CAN Bus Node* in your power supply system. The booklet also presents the *I/O Monitor2's* technical specifications.

For information about how to activate and configure the *I/O Monitor2* node, click on the Help button on the toolbar of the *PowerSuite* configuration programs. Or read the *Smartpack2 Master Controller* user guide (Doc 350020.013), if you use the controller's front keypad to configure the nodes.

System Diagram — CAN Bus Nodes

The *I/O Monitor2 CAN Bus Node* is used as a building block in *Smartpack2* based power supply systems, see Figure 1. Other CAN bus nodes, like the *Battery Monitor* and the *Load Monitor*, may also be connected to the bus. The nodes are powered directly from the CAN bus, and have dedicated inputs and outputs that expand the system monitoring and controlling capability.

The *Smartpack2* control system consists of the *Smartpack2 Master* and the *Smartpack2 Basic* controllers. The *Smartpack2 Master* serves as the local user interface between you and the system. The *Smartpack2 Basic* monitors and controls the power system's internal wiring, supplies the CAN bus with power and takes full control if the master controller fails. The Controller's Web-based User Interface (CWUI) enables you to configure and operate the system from your computer's standard web browser.

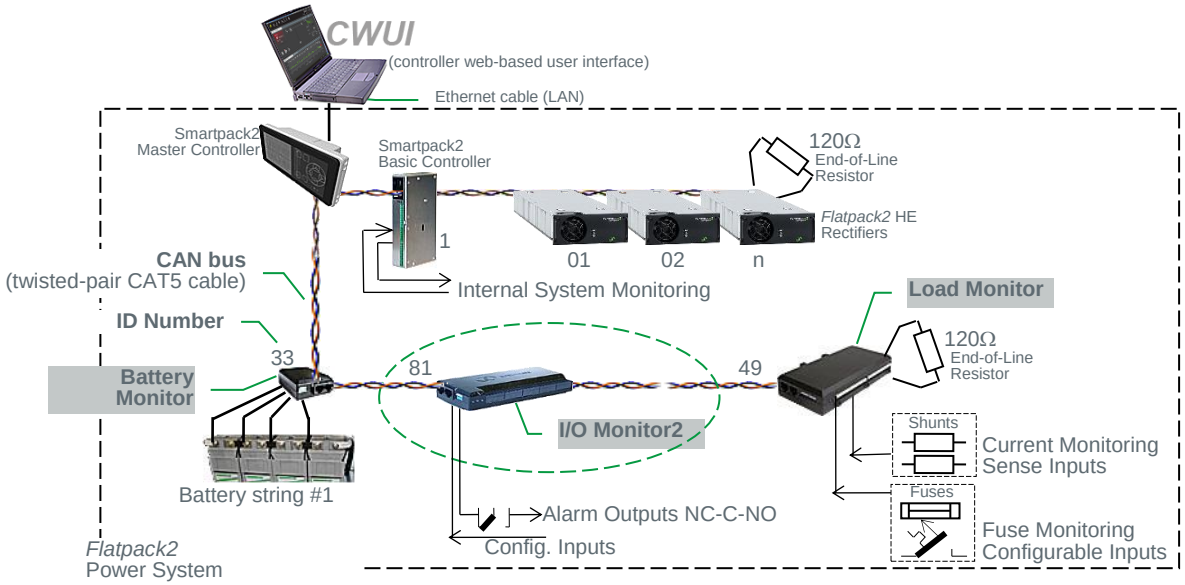


Figure 1 Example of three CAN bus nodes connected in a *Flatpack2* DC Power Supply System

2. I/O Monitor2 CAN Bus Node

The *I/O Monitor2 CAN Bus Node* (T2) is a generic, cost-effective module that enables you to decentralize and increase the number of input monitoring and output controlling signals in your power supply system.

Refer to guide 351503.033 for description of the *I/O Monitor* (T1, Outdoor) and the *I/O Monitor3* (T3, Solar Hybrid) CAN bus nodes.

Key Features

A wide range of features are implemented in the *I/O Monitor2 CAN Bus Node*, as mentioned below:

- ✓ Powered via the CAN bus; no external power supply required
- ✓ Firmware upgrade via the CAN bus (see required "SW Upload tools" on page 14)
- ✓ 6 user programmable voltage-free relay outputs for traditional remote control
- ✓ 6 user programmable and configurable inputs
  for fuse monitoring and other site equipment monitoring
- ✓ Storage of calibration data and real time event log
- ✓ Setup, configuration and calibration via *WebPower* in your computer's standard web browser
- ✓ Flexible mounting using Velcro hook-and-loop fasteners or the snap-lock tabs underneath
- ✓ Up to 14 *I/O Monitor* modules (any type) may be connected to the CAN bus
- ✓ CAN bus addressing via DIP switches

Read also chapter "Technical Specifications", page 14, for more details.

Typical Applications

The *I/O Monitor2 CAN Bus Node* (T2) is employd in *Eltek's* power systems, to implement flexible expansion and distribution of system functionality.

3. Installation of I/O Monitor2

You can install the *I/O Monitor2 CAN Bus Node* if your power system meets the following requirements:

1. You system's controller is either the *Smartpack2, Smartpack S, Compack* or the *Smartpack* controller with firmware version 2.04 or higher installed
2. You system's controller has an Ethernet port, or you have a PC with *PowerSuite* application version 2.4 or higher installed

You need standard installation tools and equipment used by an authorized electrician. NOTE: All tools must be insulated.

Safety Precautions

Follow these precautions during installation, commissioning and general handling of the power supply system.

CAUTION: For safety reasons, the **commissioning and configuration of the equipment is only to be performed** by Eltek 's personnel or by authorized and qualified persons; otherwise the warranty may be invalidated.
Please, **read the user documentation carefully** before installing and using the equipment, as installation and operation is to be performed as described in it.

Basic Installation Steps

Carry out these steps to install the *I/O Monitor2 CAN Bus Node* in your power system.

Power is ON!

1. **Assign the *I/O Monitor2* node's CAN bus address**, by setting the *I/O Monitor2*'s DIP switches. Read to chapter "CAN Bus Addressing", page 12
2. **Connect the node to the CAN bus**, by e.g. using a CAN bus cable and moving the CAN bus termination plug from the controller to the last connected *I/O Monitor2*.
   Read chapter "CAN Bus Termination", page 11
3. **Attach the *I/O Monitor2* box to dedicated slots or to a suitable surface**;
   Read chapter "Fastening / Unfastening the I/O Monitor2", page 9
4. **Connect the required input and output cabling to the node's terminals**;
   Read chapter "Connection Drawing", page 10
5. **Configure the *I/O Monitor2* node**'s operation, using *WebPower* in your standard web browser or the *PowerSuite* application, read chapter "Configuration in PowerSuite", page 13

Location of Connectors, Ports, LEDs

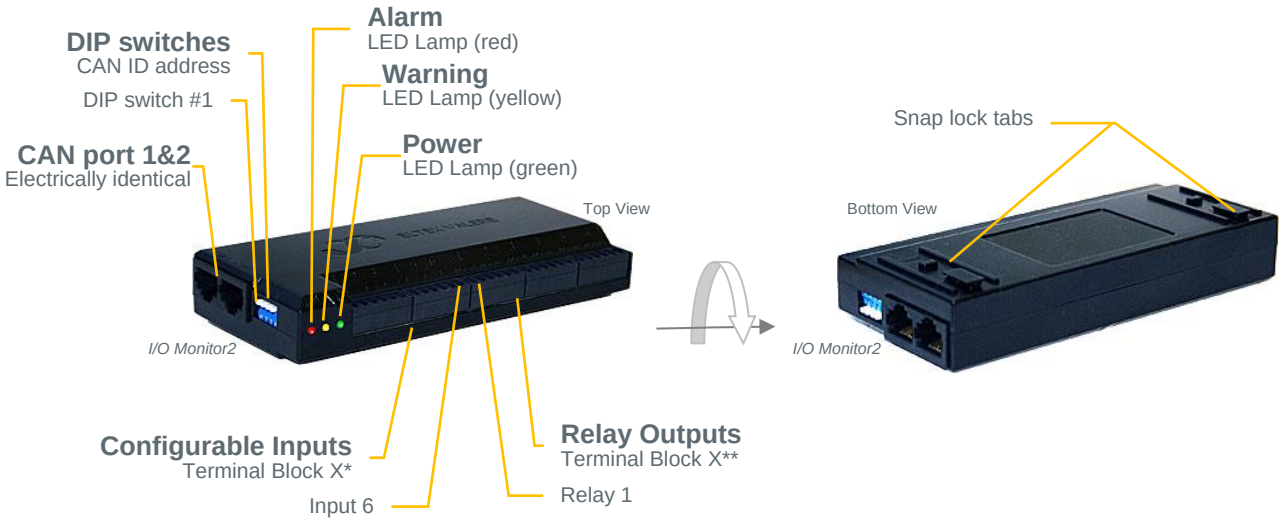


Figure 2 Location of terminals, DIP switches, CAN ports and LED indicators in the I/O Monitor2. (The output and input terminals may be black or green)

CAN port 1 and 2 are electrically identical, and are used to enable connection of the CAN bus incoming and outgoing CAT5 cables, or the RJ45 CAN bus termination plug.

Refer to chapter "Connection Drawing", page 10, for a complete list of signals, pin-out, etc.

LED Indicator	*Illumination Status*	*Description*
Power	OFF	The monitor has NO supply
	ON green	The monitor has supply
Warning	OFF	No Warning
	ON yellow	Warning (Non-critical alarm)
Alarm	OFF	No Alarm
	ON red	Alarm (Critical Alarm)
Other	Green ON & Red Flashing	Supply voltage too low
	Green OFF & Red Flashing	Firmware boot-loading

Table 1 Description of the *I/O Monitor2*'s LED illumination status

Fastening / Unfastening the I/O Monitor2

You fasten the *I/O Monitor2 CAN Bus Node* inside the power cabinet or subassembly, snapping the node's snap-lock tabs (underneath the box, see "Figure 2", page 8) to dedicated slots inside the cabinet or subassembly, see "Figure 3", page 9.

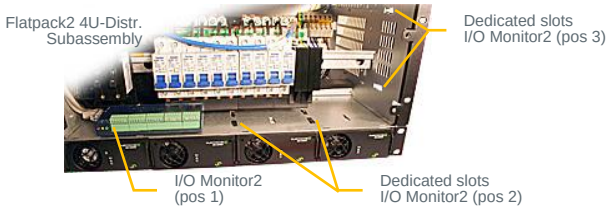
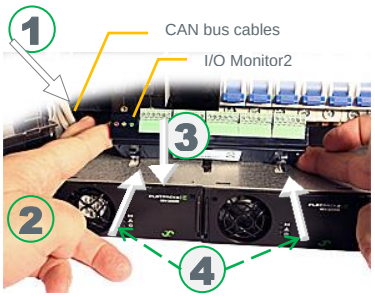


Figure 3 Location of dedicated slots for mounting I/O Monitor2 nodes in a Flatpack2 4U-Distribution subassembly

The nodes may also be mounted anywhere in the cabinet using standard Velcro hook-and-loop fasteners.



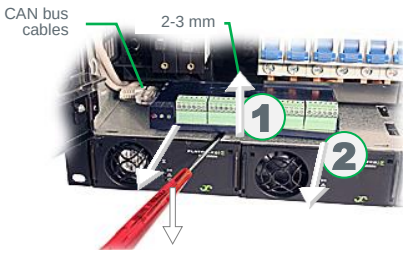
Fastening the *I/O Monitor2* node

To fasten the *I/O Monitor2* box using the snap-lock tabs:

A. Plug the CAN bus cables (1)

B. Align the box's snap-lock tabs (2) with the dedicated slots on the bottom of the distribution compartment

C. Lower the box's front (3) so that the snap-lock tabs engage with the dedicated slots, and slide the box inwards (4) along the dedicated slots until the tabs snap in place



Unfastening the *I/O Monitor2* node

To unfasten the *I/O Monitor2* box from the power system:

A. Lift slightly, 2-3 mm, the front of the box (1) (use a flat screw driver or your fingers)

B. While lifted, pull the box outwards (2), so that it slides free from the dedicated slots

Figure 4 Fastening and unfastening I/O Monitor2 nodes in a Flatpack2 4U-Distribution subassembly

Connection Drawing

Use this drawing as a connection reference for all cabling. You find the exact location of connection terminals, plugs and DIP switches, by referring to chapter “Location of Connectors, Ports, LEDs”, page 8.

The figure shows the position of the relay contacts (NC, NO) when the relay coils are de-energized (alarm mode).

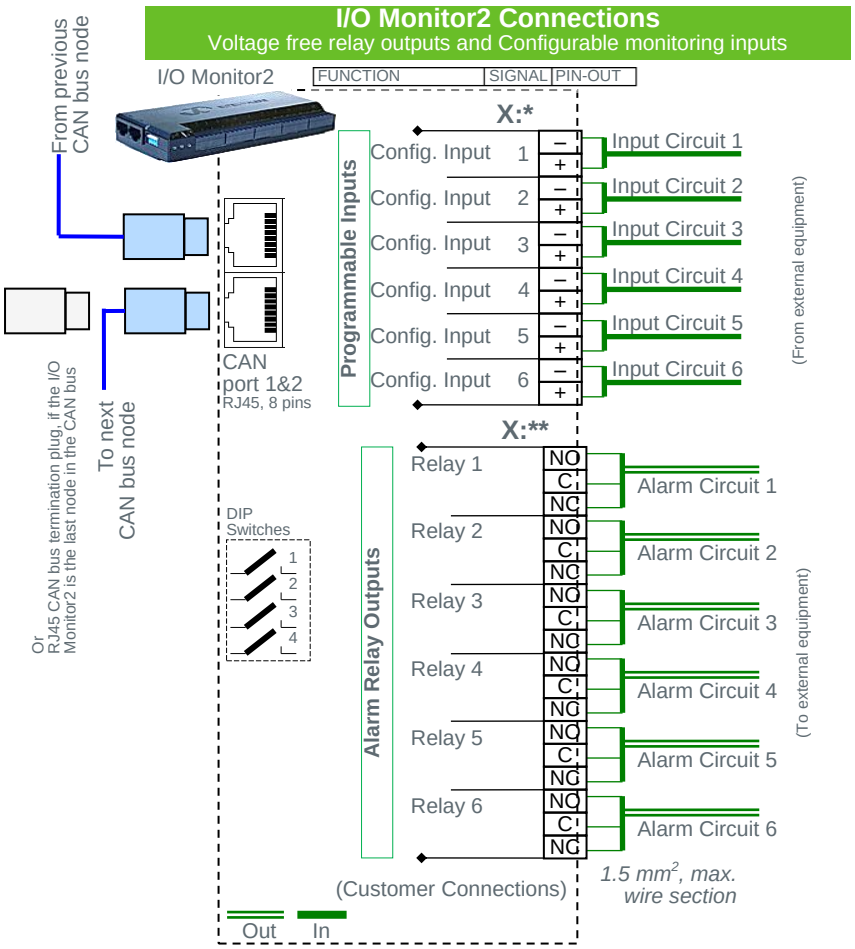


Figure 5 Connection Drawing I/O Monitor2 CAN Bus node

Read also chapter “Technical Specifications”, page 14, for more details.

CAN Bus Termination

To ensure a correct bus communication and avoid data reflection, you must always terminate the CAN bus with two 120Ω resistors, one at each end of the line (60Ω bus impedance).

Eltek power systems are shipped from factory with the CAN bus already terminated with 120Ω resistors. The **CAN bus termination** is implemented with a special RJ45 plug with built-in 120Ω end-of-line resistor.

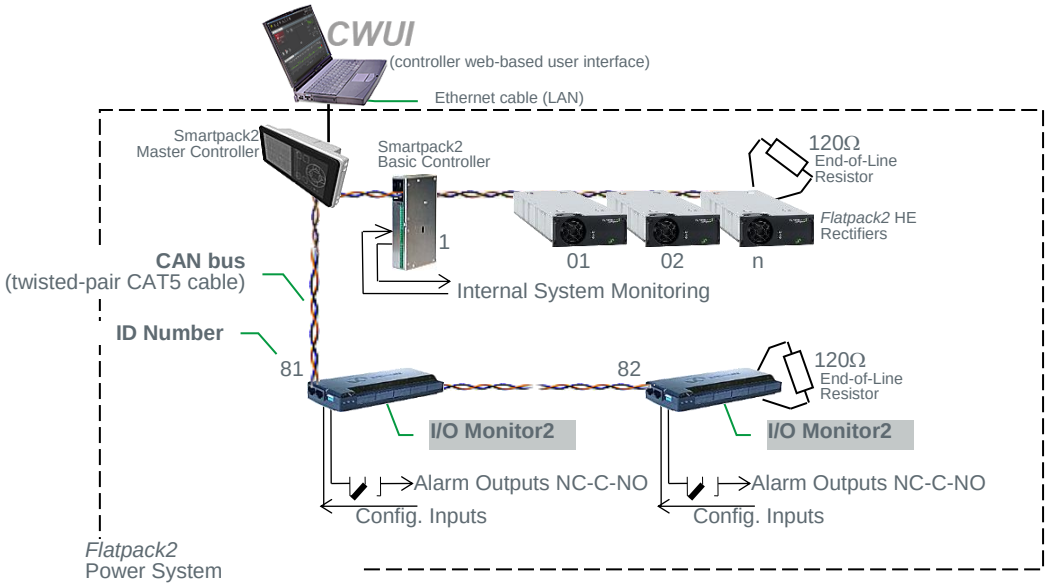


Figure 6 Example of CAN bus addressing and termination in a *Flatpack2* system with two "*I/O Monitor2 nodes*" connected the CAN bus

When connecting *I/O Monitor2* nodes (max. 14 nodes of any type) to the CAN bus, you have to remove the CAN bus termination plug from one of the CAN bus ends — e.g. from the controller's CAN port — and plug it in one of the CAN ports on the last connected *I/O Monitor2* node.

Configuration

When connecting *I/O Monitor2* nodes to the power system's CAN bus, you have to configure each of the *I/O Monitor2* nodes by:

1. **Setting the DIP switches** with the correct CAN bus address,
   to assign a unique ID number to the *I/O Monitor2*, read chapter "CAN Bus Addressing", on page 12
2. **Configuring the *I/O Monitor2* node**'s operation,
   using the controller's keypad or *WebPower* in your standard web browser or the *PowerSuite* application, read chapter "Configuration in PowerSuite", page 13

CAN Bus Addressing

The power system controller dynamically software-assigns ID numbers to rectifiers. The controller registers the rectifiers' ID numbers — or CAN bus address (01, 02…) — together with their Serial Numbers (software assignment).

Other control units make use of DIP switches for configuring their unique CAN bus ID number (hardware assignment). The ID numbers (81, 82…94), for *I/O Monitors* (of any type T1, T2, T3), are assigned by DIP switches on the nodes' side.

A maximum of 14 *I/O Monitor* nodes (of any type T1, T2, T3) may be connected to the CAN bus.

I/O Monitor	ID #	DIP Switch Position 1 —2 —3 —4
1st Monitor	81	OFF—OFF—OFF—OFF
2nd Monitor	82	**ON**—OFF—OFF—OFF
3rd Monitor	83	OFF—**ON**—OFF—OFF
4th Monitor	84	**ON**—**ON**—OFF—OFF
5th Monitor	85	OFF—OFF—**ON**—OFF
6th Monitor	86	**ON**—OFF—**ON**—OFF
7th Monitor	87	OFF—**ON**—**ON**—OFF
8th Monitor	88	**ON**—**ON**—**ON**—OFF
9th Monitor	89	OFF—OFF—OFF—**ON**
10th Monitor	90	**ON**—OFF—OFF—**ON**
11th Monitor	91	OFF—**ON**—OFF—**ON**
12th Monitor	92	**ON**—**ON**—OFF—**ON**
13th Monitor	93	OFF—OFF—**ON**—**ON**
14th Monitor	94	**ON**—OFF—**ON**—**ON**

I/O Monitor2
DIP switch configuration

ID <81>
(All switches OFF)

Note:
- The monitor's ID # corresponds to the DIP switch's binary value plus 81

Table 2 *I/O Monitor2* DIP switch addressing

Configuration in PowerSuite

To activate and configure the *I/O Monitor2* specific settings, use the controller's keypad or other GUI as *WebPower* or *PowerSuite*. For example, using the *PowerSuite* PC application, version 2.3 or higher, you connect to the power system's controller, either via an Ethernet connection or via USB port, if accesible.

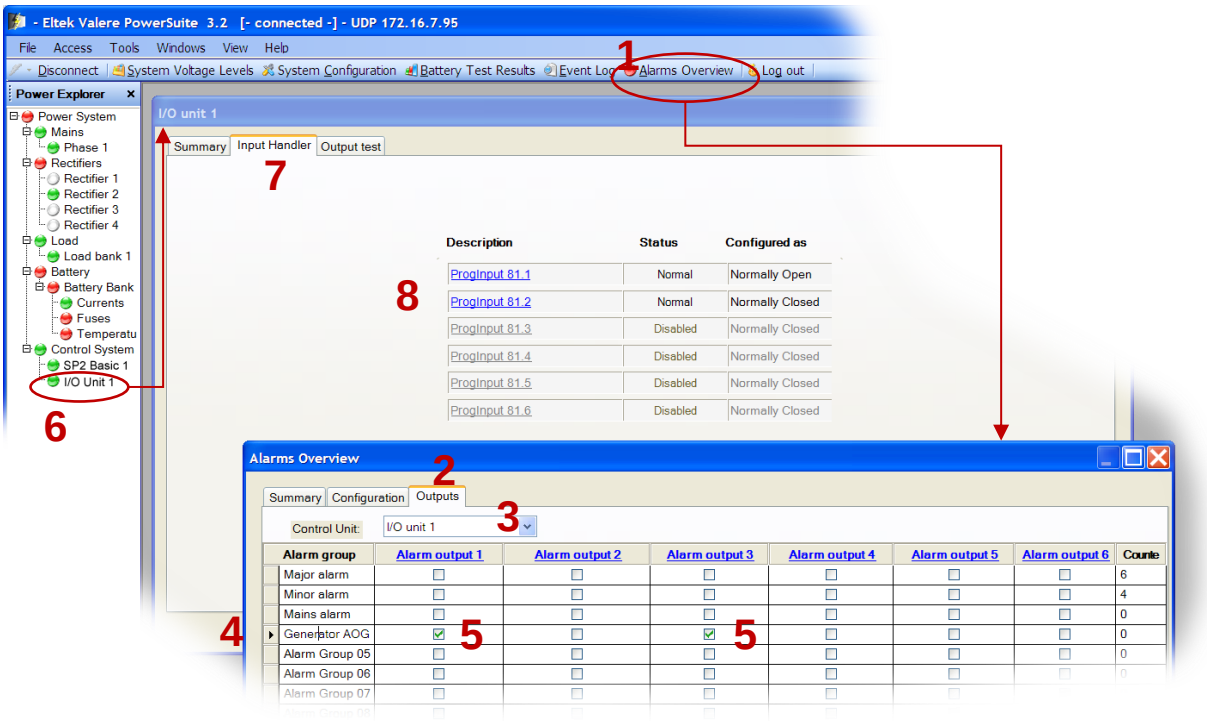


Figure 7 Example of I/O Monitor2 configuration via PowerSuite

In general, the connected *I/O Monitor2* node(s) are displayed in the *PowerSuite's* Power Explorer pane (6), under the *Control System node*.

For configuring the *I/O Monitor2* outputs:

A. Click on the "Alarms Overview" icon on the toolbar (1), then on the dialog box's "Outputs" tab (2)
B. Display the *I/O Monitor2's* alarm relays by selecting the acual "I/O Unit X" in the Control Unit's drop down list (3)
C. If required, click and define an "Alarm Group", e.g. "Generator AOG" (4)
D. Check the "Alarm Output X" relays (5) to assign to the Alarm Output Group, e.g. Alarm Output 1 and 3

For configuring the *I/O Monitor2* inputs:

A. Open the *I/O Monitor2*'s icon under the *Control System node* (6)
B. Click on the "Input Handler" tab (7)
C. Click on the "ProgInput XX.Y" alarm monitor links (8)
(enable the input, change the description, select the input activation type, the event or system internal action, the alarm output group or relays to activate, etc.)

For more detailed description of how to configure the CAN Bus nodes, read the *PowerSuite* application's **Online Help**.

4. Technical Specifications

I/O Monitors: [1]-Outdoor / [2]-Type 2 / [3]-Type 3	
6 configurable inputs: "digital", voltage/current measurement	
○ NO/NC, Pull Up/Dn, Diode Matrix Voltage range 0-75V (78mV res)	⇒ No1-6(1,2), No1-2(3)
○ *NO/NC, Voltage range 0-10V (13mV resolution)*	⇒ *No3-6(3)*
○ *Current measurement 4-20mA (27µA resolution)*	⇒ *No5-6(3)*
6 configurable relay outputs: normally activated/deactivated	
○ Dry/Form C, Max 1A/60W/75V	⇒ No1-4(1,3), No1-6(2)
○ *Dry/Form C, Max 8A/300W/75V*	⇒ *No5-6(1,3)*
Outdoor cabinet specific ports: temp, fan control/monitoring	
○ *2xTemp sensor inputs (-40-100°C with 0.14°C res.)(1,3)*	
○ *2xFan speed inputs (0-5V or pulse sense 1-10 p/r)(1,3)*	
○ *2xFan speed control outputs (0-10V, max -10/+20mA) (1,3)*	
Max. CAN Power consumption	Max 3.4W(1,2,3)
SW Part number	402088.009(1,2,3)
Functionality	Data logging (non-volatile memory) ○ 10000 time stamped logs ○ 4 user selectable data points ○ Default: 2x Temp. 2x Fan Speed

All CAN Nodes			
Max. nodes	14 units of same type can be added a single CAN bus (Also see CAN Power)		
Mounting	Slotted groove for post mounting or DIN rail/Velcro (for Battery Monitor)		
Visual Indication	3xLED (1xLED CAN Power) ○ GREEN: Power ○ YELLOW: Warning ○ RED: Alarm (Flashing LED: insufficient power)		
SW Upload tools	Smartpack2 Master through CAN or FWLoader v3.25 or newer and IXXAT USB-to-CAN Converter (p/n: 208565)		
Casing material	Plastic - V0 rated / Steel (CAN Power)		
Operating temp	-40 to 70°C (-40 to 158°F)	Storage temp	-40 to 85°C (-40 to 185°F)

Applicable Standards	
Electrical safety	IEC 60950-1 UL 60950-1 CSA C22.2
EMC	IEC 61000-6-1 IEC 61000-6-2 IEC 61000-6-3 /A1 IEC 61000-6-4 ETSI EN 300 386 v1.3.3 FCC Part 15B Subpart 109
Environment	2002/95/EC (RoHS) & 2002/96/EC (WEEE) ETS 300 019-2-1 Class 1.2 ETS 300 019-2-2 Class 2.3 ETS 300 019-2-3 Class 3.2

Specifications are subject to change without notice
242100.CAN.DS3 – v3 (part)

Notice:
Specifications marked in grey, italic text does not apply to I/O Monitor2.

Part Numbers

Part no.	Description
242100.304	*I/O Monitor Type 1 (T1) Outdoor Applications*
242100.502	I/O Monitor2 Type 2 (T2) Generic Applications
242100.306	*I/O Monitor3 Type 3 (T3) Outdoor and Solar Hybrid Applications*

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