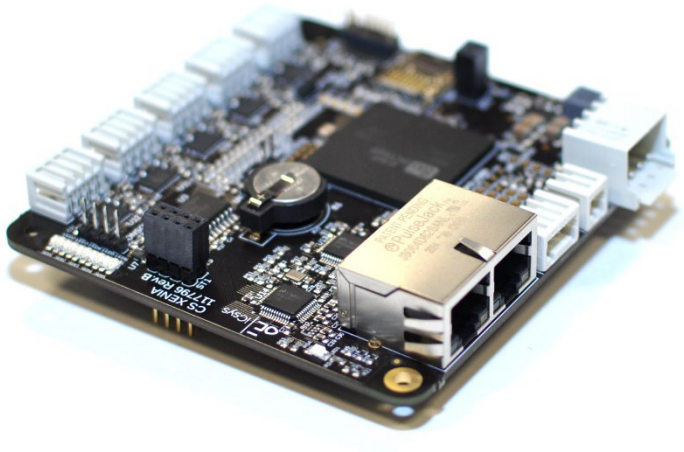
USER MANUAL



XENIA CONTROLLER

REVISION B

REVISIONS

PUBLISHED	REVISION	NOTES
02.07.2025	A	Initial release.
30.09.2026	B	Added maintenance chapter.

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1 INTRODUCTION

1.1 PURPOSE AND SCOPE

This document outlines and defines the configuration and operation of the Xenia Controller.

The manual is to be used by trained and competent personnel only.

1.2 ABBREVIATIONS

ABBREVIATION	DESCRIPTION
ESD	Electrostatic Discharge
IP	Internet Protocol
PCB	Printed Circuit Board
TCP	Transmission Control Protocol
UDP	User Datagram Protocol

1.3 SUPPLIER CONTACT INFORMATION

Ixys AS
Langmyra 11
4344 Bryne
Norway

+47 51 42 22 22
post@ixys.no
https://ixys.no

1.4 DOCUMENT REFERENCES

DOCUMENT NUMBER	DESCRIPTION
117796-ICS-PD-DAS-0001	Datasheet
ICS-SW-PRT-0005	Register list expansion PCBs

See ixys.no for the latest revisions of these documents.

2 BATTERYHEALTH, SAFETY AND ENVIRONMENT

2.1 GENERAL

Safety Notes and General Precautions shall be presented to all personnel concerned prior to testing, operation, maintenance, and repair. The operations shall be performed by the responsible engineer/supervisor. The personnel using this equipment must have knowledge of this type of equipment and have familiarized themselves with the applicable procedures and manuals for this product.

2.2 SAFETY MESSAGE LEVELS

Safety message level		Indication
	**DANGER:**	A hazardous situation which, if not avoided, will result in death or serious injury
	**WARNING:**	A hazardous situation which, if not avoided, could result in death or serious injury
	**CAUTION:**	A hazardous situation which, if not avoided, could result in minor or moderate injury or damage to equipment
	**Electrical Hazard:**	The possibility of electrical risks if instructions are not followed in a proper manner
Note:		A potential situation which, if not avoided, could result in an undesirable result or state. A practice not related to personal injury

3 TECHNICAL INFORMATION AND DATA

3.1 TECHNICAL DESCRIPTION

The Xenia Controller is a PCB running a Linux operating system along with VJU Server and has multiple connections for Ethernet and serial communication.

The Xenia Controller is capable of being an Ixys Control System (CS) master, stacked physically together with any boards from the Ixys CS range to form a complete control system for any application.

All data is available over Modbus for usage from VJU or other systems, and the device can be configured through a user-friendly web-interface. The board has built-in monitoring of supply voltage and water detection.

3.2 TECHNICAL DATA

Manufacturer	Ixys AS
Ixys part number	117796
Description	PCB Xenia Controller
Weight	~110 g
Dimensions	96x90x19 mm
Supply voltage	24 V DC
Power consumption	~5 W
Communication	1x RS232, 4x RS232/485, 1x CAN, 2x 10/100 Mbps Ethernet

3.3 WARRANTY CONDITIONS AND GUARANTEE

- Improper use of equipment where use is not reflected in what it was intended to.
- Where general maintenance is not performed leading to defective parts or other types of defects.
- Incorrect handling or use of equipment.
- Packing is not carried out in an ESD protective way.

3.4 ACCESSORIES

Ixys Part Number	Description
101337	Battery Coin Cell CR1220
116407	MicroSD Card 32 GB
100086	Connector Wago 4-way Cable Contact (serial & CAN)
100040	Connector Wago 2-way Cable Contact (water detect)
112073	Connector Wago 3.5 mm (power)

4 HARDWARE DESCRIPTION

4.1 DRAWING

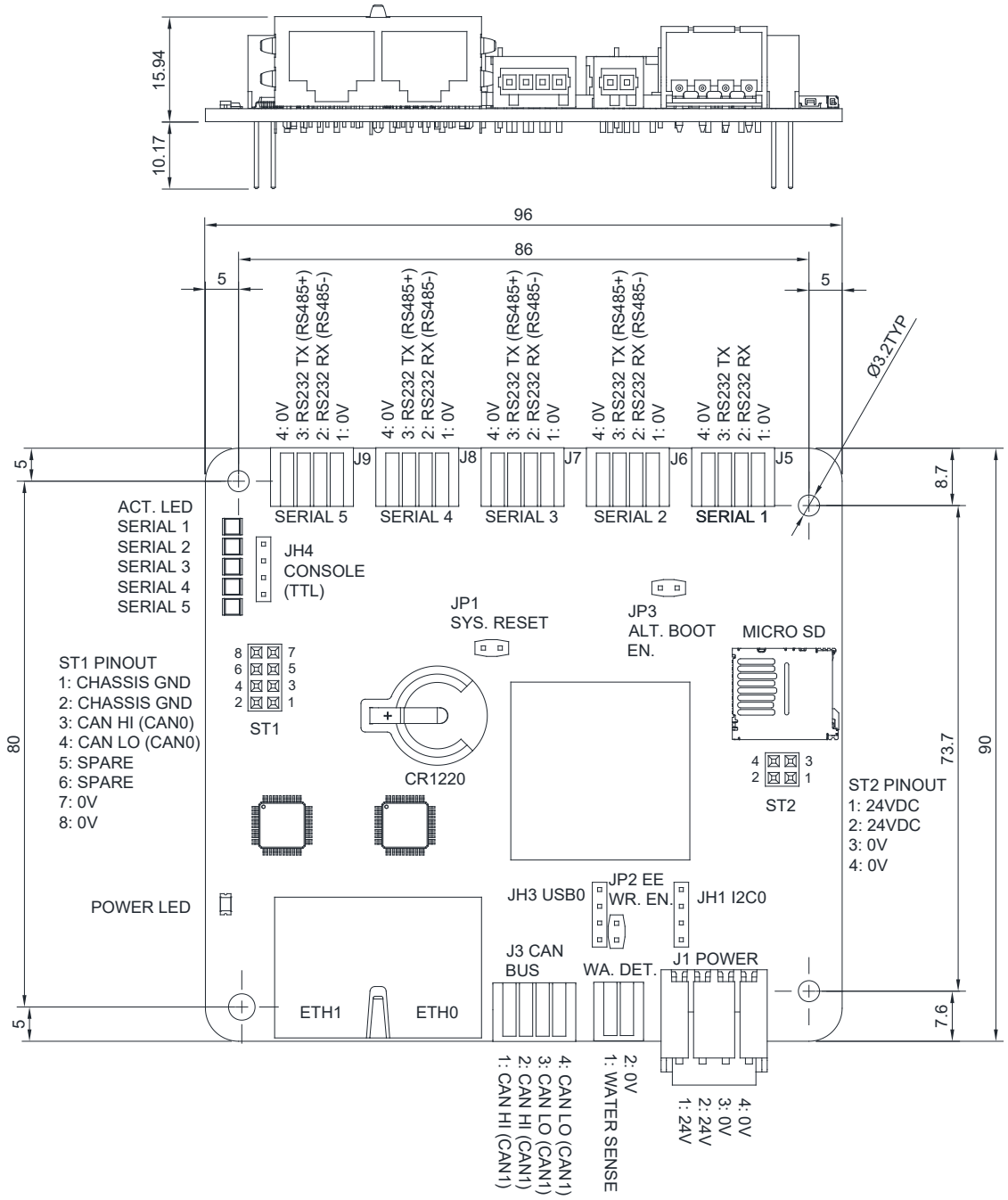


Figure 1 - Dimensions and pinout

4.2 LEDS

The POWER LED will light up as soon as the board is powered correctly.

Each serial interface has its own dual color LED. When transmitting data, it will light green. When receiving data, it will light red.

Note: While the device is starting, all LEDs may light up in an irregular pattern the first few seconds.

Each copper port has two LEDs. The green LED is a link indicator. When it's lit, a link has been established on this port. The yellow LED is flashing when activity is present on the port.

4.3 CONNECTIONS

The Xenia Controller should be powered by connecting supply voltage on J1.

J2 is usable for water detection. If pin 1 of J2 is shorted to pin 2, the Xenia Controller will detect this, and indicate it as described in section 6.2.

Any Ixys CS PCB can be stacked underneath or on top of this PCB through ST1 and ST2 headers. The Xenia Controller should be placed on the far end of the stack to ensure proper CAN bus termination. Bus termination is always active on the Xenia Controller. This also applies to the external CAN bus port.

See chapter 5.3 for details on the stack master functionality.

5 FUNCTIONAL DESCRIPTION

5.1 GENERAL

The Xenia Controller can be used as a generic ARM Linux device, but is primarily meant for running a VJU server as part of a control system. The following sections describe the board's various features.

The Xenia Controller has a water detect input, which can be used to indicate water intrusion. It also includes supply voltage measurement. See section 6.2 for details on how to read out these values.

The default IP of the Xenia Controller is 10.0.37.238/24.

5.1.1 WEB INTERFACE

The device can be configured from a user-friendly web interface. The web interface is accessible by opening the Xenia Controller's IP address in any modern browser.

The About page shows the Xenia Controller's serial number, hardware revision, supply voltage, time (UTC) and firmware version. It's also possible to update the firmware or perform a factory reset to return all settings to default, as well as reboot the Xenia Controller.

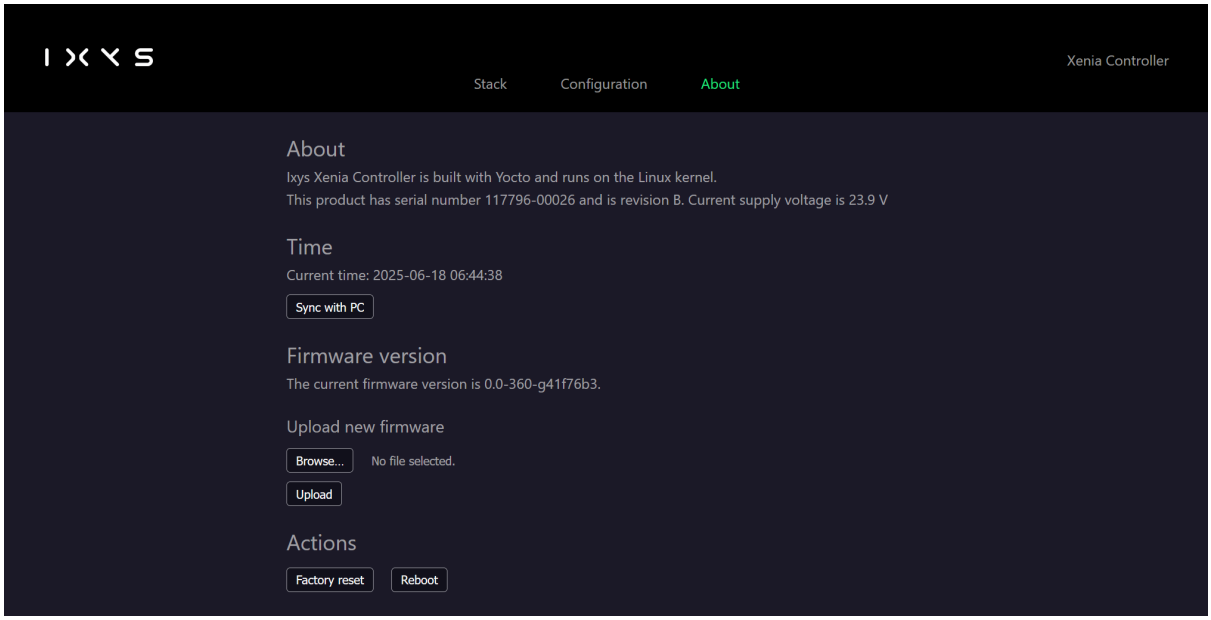


Figure 2 About page

The Stack page displays connected stacked nodes and their inputs and outputs. See section 5.3 for more details.

The Configuration tab allows configuring both the network interfaces.

The second tab shows available configuration for the five serial interfaces available.

5.1.2 VJU SERVER

Xenia runs a VJU server, and by default its web interface is accessible by accessing Xenia's IP on port 5100 from any modern web browser.

VJU Server is part of the Ixys VJU Studio, which can be used to build complete control solutions for any system. VJU Server exposes all its data over OPC UA.

It's possible to either connect a VJU Display directly to VJU Server on a Xenia, or to have a VJU Server or other software running elsewhere to read and write data from the VJU Server running on Xenia.

For further information on how to use and configure VJU Server refer to the VJU platform documentation.



Figure 3 VJU Server page

5.1.3 COMMUNICATION FAILURE

When used as part of a control system, it is usually expected that another device in the system will write desired output states to the Xenia Controller periodically. Should such writes not happen for a given period, this often indicates a system problem.

The Xenia Controller therefore monitors writes and can be configured to set all outputs to pre-defined states if no further writes occur a given period. This period is called *communication failure timeout*, and can be set from the web interface, or in a Modbus register.

By default, the Xenia Controller is set up to leave all outputs as-is when the communication failure timeout triggers. For each output, there are two settings that can be configured: enable or disable communication failure feature, and communication failure value.

If communication failure is enabled for an output, the Xenia Controller will set the output to the communication failure value on timeout. If communication failure is disabled for an output, the output will be left with the current value on timeout.

Communication failure can be enabled or disabled per output both through registers as described in section 6, and in the web interface on the Stack page.

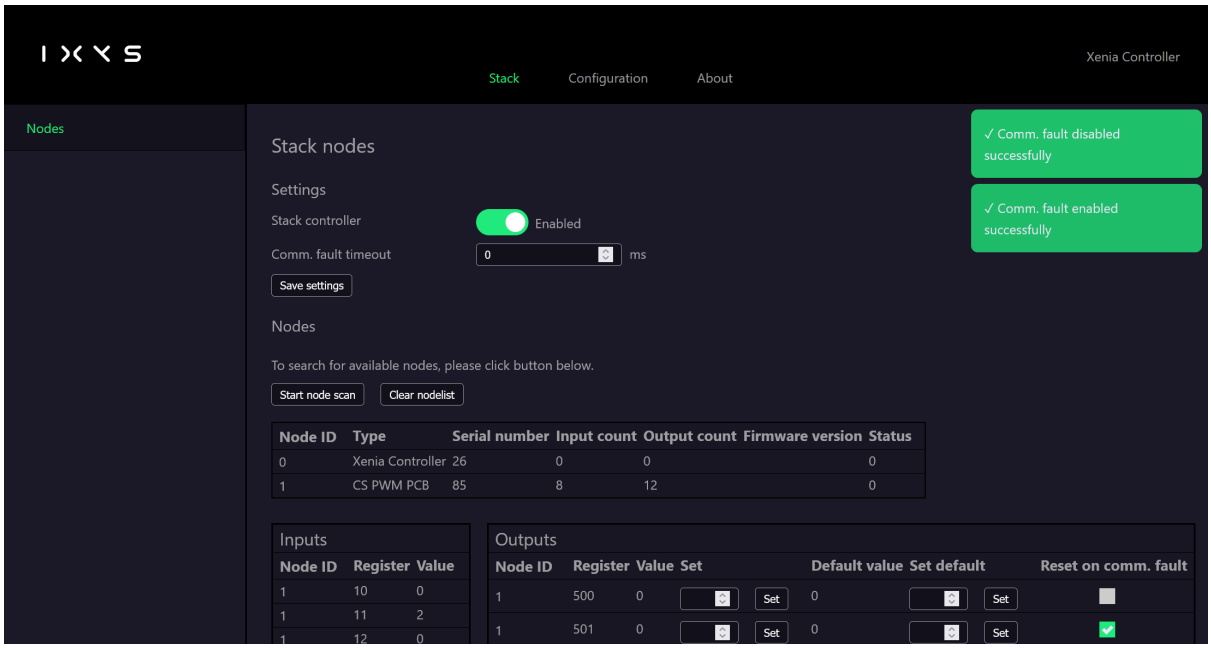


Figure 4 Setting up Communication Failure feature

5.1.4 HEARTBEAT BROADCAST

Every 5 seconds, the device sends a UTF-8 encoded JSON object in a UDP packet to the broadcast IP 255.255.255.255 on port 65000. This message includes the device's IP address, firmware version, serial number, and allows easy identification.

Ixys VJU Studio software will use this to automatically identify the device, but it can also be found manually for instance with Wireshark, or by other applications.

5.1.5 MODBUS TCP/UDP

The Xenia Controller supports the Modbus protocol over TCP and UDP for reading and writing all registers described in section 6.

All registers are readable with Function Code Read Holding Registers and Read Input Registers. All registers are writable with both Write Single Register and Write Multiple Registers.

5.1.6 FIRMWARE UPGRADE

Firmware upgrades are done through the web interface. Click “browse” on the About page, select the upgrade file and click “upload”. Wait for the progress indicator to finish.

The log pane can be expanded to see log messages from the upgrade progress. The device will reboot to complete the upgrade.

Firmware upgrades are made available on ixys.no. Upgrades are provided as a swu-file. Both the actual firmware and the included web interface will be upgraded.

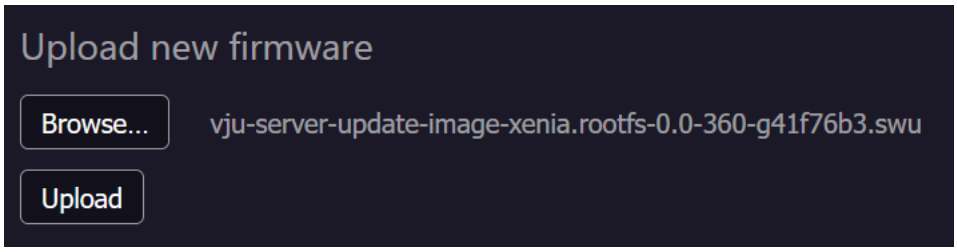


Figure 5 Xenia Controller Upgrade

5.2 NETWORK CONFIGURATION

By default, both network ports are configured as two individual network interfaces. An option to set them into switch mode is available. This option changes the behavior to make it act as an Ethernet switch.

Interface 1 is default set with a static IP address (see section 5.1). It can be configured for DHCP.

Interface 2 is default DHCP. It can be configured for a static IP address.

If there is a DHCP server available on any network interface, Xenia can use NTP to get the current time.

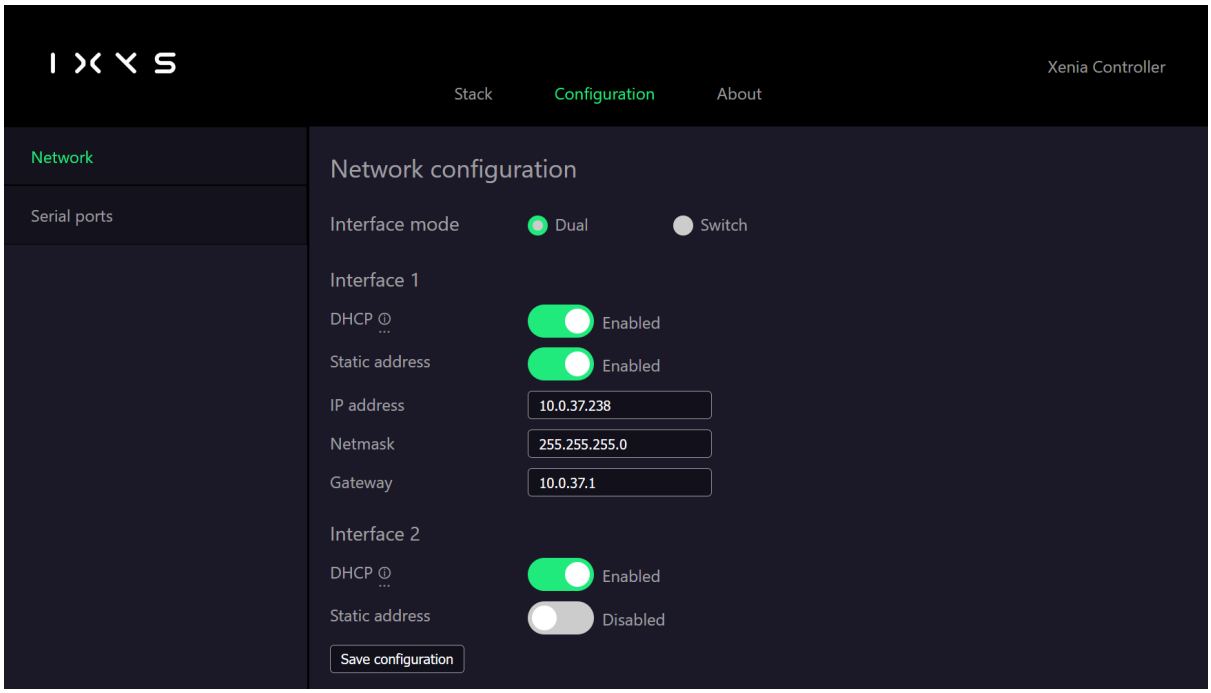


Figure 6 Xenia Controller network configuration

5.3 SERIAL CONFIGURATION

All five serial ports are by default set to RS232 mode.

Port 1 is permanently RS232 and cannot be changed.

Port 2-5 can be changed to RS485 mode, with or without termination.

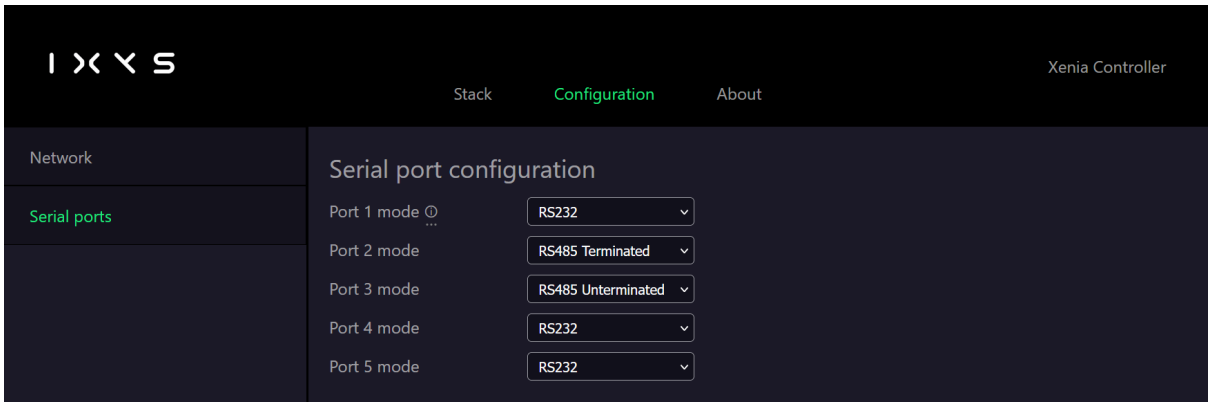


Figure 7 Xenia Controller serial configuration

5.4 STACK MASTER FUNCTION

5.4.1 GENERAL

It's possible to use the Xenia Controller as the master device of an Ixys Control System stack. This makes it possible to build a system of multiple CS PCBs in a stack, which uses the stack headers for communication and power between them. All inputs and outputs of the stack are usable over network via one or both Ethernet interfaces.

The stacked PCBs use an internal CAN bus for communication, and it's important to terminate this bus. The Xenia Controller should be placed at the start or end of the stack. See section 4.3.

Each CS PCB has several outputs, inputs and settings available, making it possible to build a control system for almost any application. Multiple PCBs of the same type can be used in a stack, to get the desired features. See the product list on ixys.no for details on available PCBs.

All stack outputs can be used with the communication failure feature, described in section 5.1.2, and the communication failure timeout should be set according to the system requirements.

The main stack functionality is available on the Stack page in the web interface.

5.4.2 NODE SCAN

For the stack functionality to function, the Xenia Controller needs to know which PCBs are stacked underneath it. This is determined when a node scan is performed.

When a node scan is performed, the Xenia Controller will establish communication with all stacked PCBs and add them to its list of stack nodes. This list is shown both in the web interface and in Modbus registers (see section 6.5). A node scan ends when no further PCBs are found.

Each PCB in a stack must have a unique node ID, which is typically set by adjusting a physical rotary switch on the PCB when assembling the stack. If duplicate IDs are discovered during a node scan, an error will be shown in the web interface, and Modbus registers for node ID 19 populated with data for the duplicate node.

Should a stack node stop communicating after having been identified during a node scan, its serial number will be shown as 0.

It's possible to clear the node list manually, without performing a new node scan.

Note: There can only be a single stack master. If there are multiple stack master PCBs on top of a stack, it's important to disable the stack controller setting on the additional master PCBs. This is done in the Stack page on the web interface. Alternatively, only perform a node scan on one of the masters. If a node scan is performed on multiple, the node list must be cleared on the additional that is not supposed to be the master.

5.4.3 INPUTS AND OUTPUTS

The number and type of inputs and outputs available in a CS stack is dependent on the type and number of PCBs stacked. The number of inputs and outputs for each scanned stack node can be viewed in the web interface and in the stack node information registers (see section 6.5), and the document ICS-SW-PRT-0005 explains what the inputs and outputs values represent.

Stack node inputs and outputs have designated sections in the register list of the Xenia Controller. Inputs and outputs are sorted by node ID, so the inputs for node ID 1 will come before inputs for node ID 2 and so on. For example, if node ID 1 has 8 inputs, inputs for node ID 2 will start at the register 130 (base stack node input register is 122, plus 8).

The web interface shows live data for all inputs and outputs. For each output, it's also possible to set the current value, as well as controlling communication failure behavior and value.

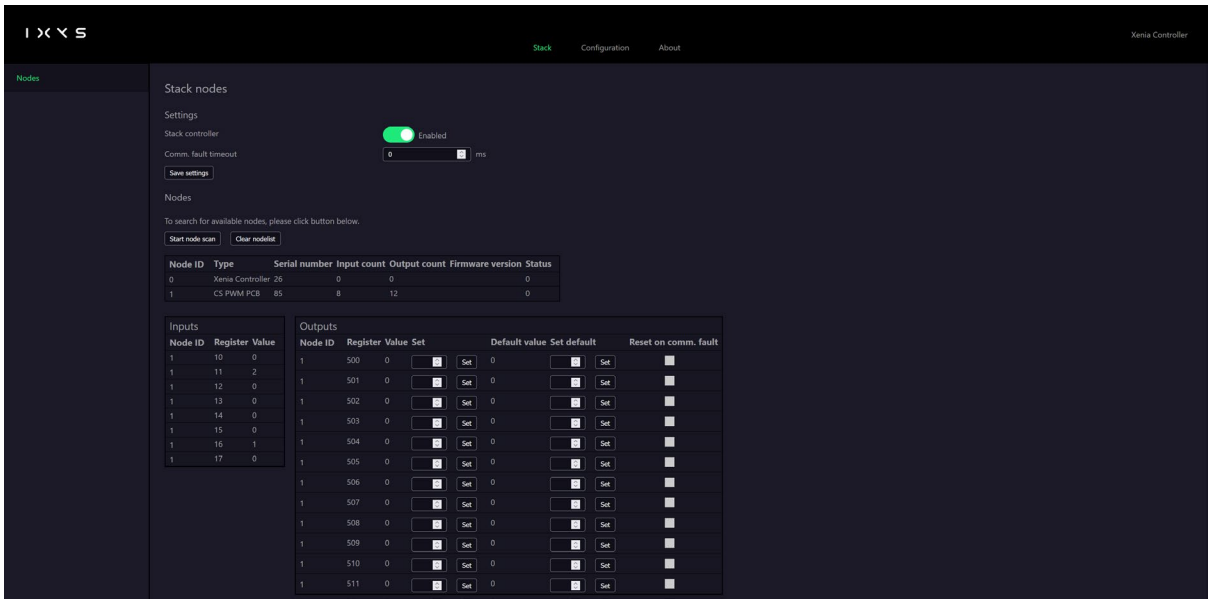


Figure 8 Stack configuration

5.4.4 SETTINGS

Each stack node has settings that can be changed. Each setting is identified by an index and has a 16-bit value. What each setting controls is given per type of stack node in ICS-SW-PRT-0005.

It's possible to read or write settings through Modbus registers (see section 6.6).

6 REGISTERS

The following sections describe all registers that can be read or written either over Modbus.

6.1 DATA TYPES

The following table describes the data types used. For 32-bit values two Modbus registers are used, where the first is the most significant.

Name	Size	Value Range
INT16	2 bytes	-32,768 to 32,767
UINT16	2 bytes	0 to 65,535
INT32	4 bytes	-2,147,483,648 to 2,147,483,647
UINT32	4 bytes	0 to 4,294,967,295
REAL32	4 bytes	1.2E-38 to 3.4E+38

6.2 HEADER REGISTERS

Address	Description	Default	Note	Data Type
0	PCB Type	39	Xenia Control PCB Type = 39	UINT16
1	Serial Number	N/A	Last part of the serial number	UINT16
2	Firmware Version	N/A	Numeric part of firmware version	UINT16
3	Status	N/A	Bit0 = Reserved Bit1 = Water Alarm	UINT16
4	Modbus Port	502		UINT16
5	Supply Voltage	N/A	Unit = 0.1 V	UINT16
6	Timeout	1000	Milliseconds without communication before Com Fail is triggered. Changes to this register will be stored.	UINT16
7	Node Address	1	Modbus Node Address	UINT16
8	Heartbeat	N/A	1 Hz counter. Rolls over to zero after 65535	UINT16
9	Reserved	N/A		UINT16

6.3 INPUT REGISTERS

Input registers are not writable.

Address	Description	Note	Data Type
10-499	Additional stack node inputs	See section 5.3.3 and ICS-SW-PRT-0005	

6.4 OUTPUT REGISTERS

Address	Description	Default	Note	Data Type
500-799	Additional stack node outputs	N/A	See section 5.3.3 and ICS-SW-PRT-0005	
800-1099	Com-fail States	0	These registers define the value to be set in the corresponding output register (500-799) in the event of a communication timeout if the Com-fail Config register (1100-1399) is set to 1	
1100-1399	Com-fail Config	0	These registers define the behavior of each output register (500-799) in the event of a communication timeout. 0=Stay as is 1=Set to the value defined in Com-fail State Register (800-1099)	

6.5 STACK NODE INFORMATION

Xenia itself is always node 0, so the maximum number of additional stack nodes is 17.

Address	Description	Note	Data Type
1400-1419	Node Type	Type number of node	UINT16
1420-1439	Node Serial Number	Resets to zero if lost connection with Node	UINT16
1440-1459	Node Inputs/Outputs	Byte 0 = Number of input registers Byte 1 = Number of output registers Zero until “Node Scan” performed	UINT16
1460-1479	Node Firmware Version		UINT16

If a new node with Node ID outside the range of 1-18 or same Node ID as existing node, its information will be available as Node ID 19 (e.g. at 1419, 1439 and 1479). A new Node ID can be sent to the board by writing to setting index 0 as described in section 0.

Note: Stack node PCBs with jumpers or rotary hex switch set to any Node ID except 0 will be overridden at power reset to the physically set Node ID.

6.6 STACK NODE SETTINGS

Write to registers 1480-1486 first and then trigger the command by increasing register 1487 by one. Completion of command will be indicated by register 1488 set equal to register 1487.

Address	Description	Note	Data Type
1480	Setting Write Command	Set to 1 to prepare write command	UINT16
1481	Setting Read Command	Set to 1 to prepare read command	UINT16
1482	Setting Type	Type number used for Read/Write Command	UINT16
1483	Setting Node-ID	Node-ID used for Read/Write Command	UINT16
1484	Setting Serial	Serial number used for Read/Write Command	UINT16
1485	Setting Index	Setting Index used for Read/Write Command	UINT16
1486	Setting Value	Value used for Write Command or feedback from Read command	UINT16
1487	Setting Trigger	Write or read command is performed when this is unequal to 1488	UINT16
1488	Setting Completion	Write or read command is completed when this is equal to 1487	UINT16

7 TROUBLESHOOTING / FAULTFINDING

Symptom	Possible cause	Remedy
Power LED not lit	Not powered	• Verify power connections are according to specifications in section 3.2 and connected as in section 4.3
	Faulty PCB	• Contact Ixys support
No link LED	Linked device not powered	• Verify linked device is powered
	Faulty cabling	• Try different network cable • Verify cable used with other equipment
Intermittent link LED	Poor cabling	• Try a different network cable. • Verify cable used with other equipment
	Wrong configuration	• Verify that linked device is correctly powered. • Try using fixed speed and duplex on both devices
Not able to access web interface	Wrong IP address being used	• Use VJU Device Discovery or read broadcast messages to identify IP
	Client device in wrong subnet	• Verify the client is in the same subnet as the PCB

8 MAINTENANCE

8.1 BATTERY

The Real-Time Clock (RTC) on Xenia Controller is backed up by a CR1220 coin-cell battery mounted in a socket on the PCB. The battery maintains the RTC and system time while the PCB is powered down.

Based on the battery characteristics, the RTC specifications, and measurements performed on Xenia hardware, **we recommend replacing the battery every two years** to ensure reliable retention of the system time during periods when the PCB is not powered.

Notes:

- When the battery is replaced, the RTC will lose the current time and must be set again after the PCB has been powered up.
- After battery replacement, the RTC oscillator will not start until the PCB is powered up for the first time. Until this initial power-up, battery current consumption is approximately an order of magnitude lower than during normal battery-backed RTC operation.