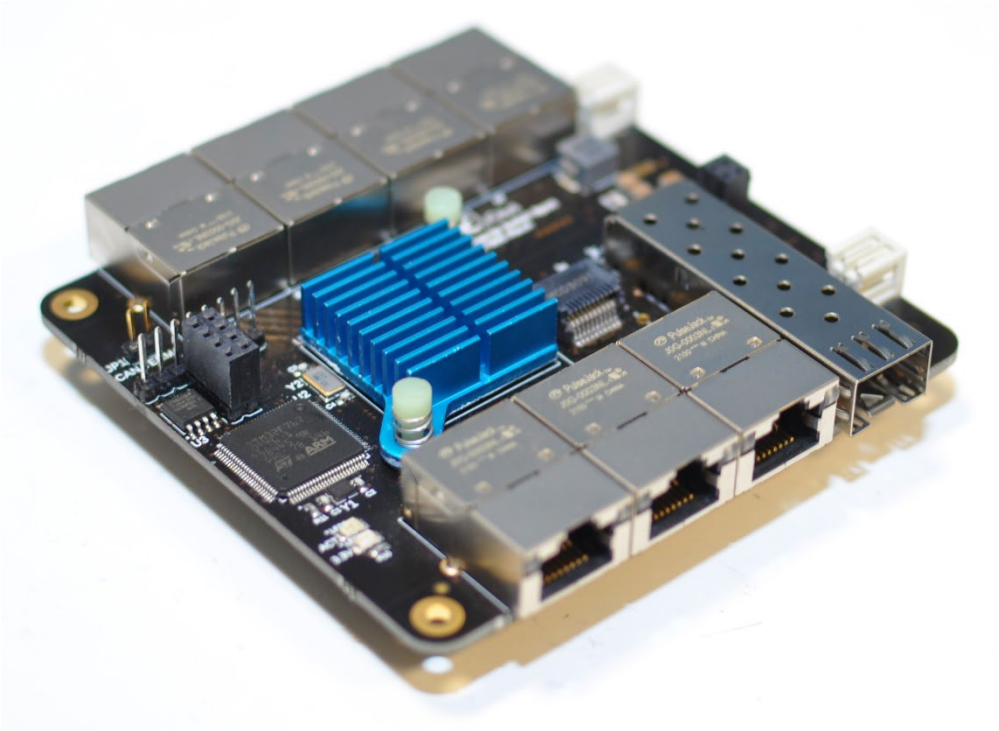
USER MANUAL



Equipment Description	8-Port Ethernet Switch
Ixys Part Number:	117996, 117997, 117998

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Published	**Revision number**	**Revision reason**	**Revised by**
14.08.2024	C	Changed type ID to new	FTO
05.10.2023	B	Added default values	VHA
30.05.2023	A	Issued for release	VHA
Prepared		**Checked**	**Approved**
FTO		EAP	VHA

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1. INTRODUCTION

1.1. GENERAL NOTES

This document outlines and defines the installation, operation, and maintenance procedures for the Ixys 8-Port Ethernet Switch PCB. The manual will contain all relevant data and methods to be able to use and maintain the device for its intended purpose.

It will be stated in the manual everything from technical specifications, installation, and maintenance to troubleshooting.

1.2. PURPOSE AND SCOPE

The purpose of this manual is to give instructions to install, operate and maintain the 8-Port Ethernet Switch PCB supplied by Ixys AS.

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

1.3. ABBREVIATIONS

Abbreviation	Description
PCB	Printed Circuit Boards
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
ESD	Electrostatic Discharge
IP	Internet Protocol

1.4. SUPPLIER CONTACT INFORMATION

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2. HEALTH, 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
NOTICE:		A potential situation which, if not avoided, could result in an undesirable result or state A practice not related to personal injury

3. SPECIFICATIONS

3.1. DESCRIPTION

The 8-Port Ethernet Switch is a printed circuit board with multiple Ethernet ports for connection of multiple Ethernet devices in a network. SFP slots can be installed instead of port 3 and 4 at production to interface the switch to an optical fiber for long distance high speed communication (up to 2.5Gbps).

Through stack connectors, the switch can share power and data bus with other Ixys CS range boards. The attached Ixys CS expansion IO boards will automatically be discovered by the switch and the Modbus register list will add registers for the IOs on the connected boards.

Configuration is possible through Web interface and by Modbus UDP/TCP protocol. Diagnostics is also possible to read from the Modbus like port traffic, link status and speed. The board has inbuilt monitoring of supply voltage, ambient temperature, switch core temperature and water detector.

3.2. TECHNICAL DATA

General	
Manufacturer	Ixys AS
Description	PCB Ethernet Switch 8-Port
Weight	~120g
Dimensions	96 x 90 x 13mm (PC104 format)

Electrical Data	
Supply Voltage	8 – 30 VDC
Power Consumption	< 5W

Cable Connectors	
Ethernet Ports	RJ45
J5 Power Supply	Wago 733-102
J10 Water Detect	Wago 733-102

Other	
Speed on SFP ports	1000/2500 Mbps
Speed on Copper ports	10/100/1000 Mbps
Default IP address	10.0.37.239
Recommended spacers under PCB	15mm

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 not carried out in an ESD protective way.

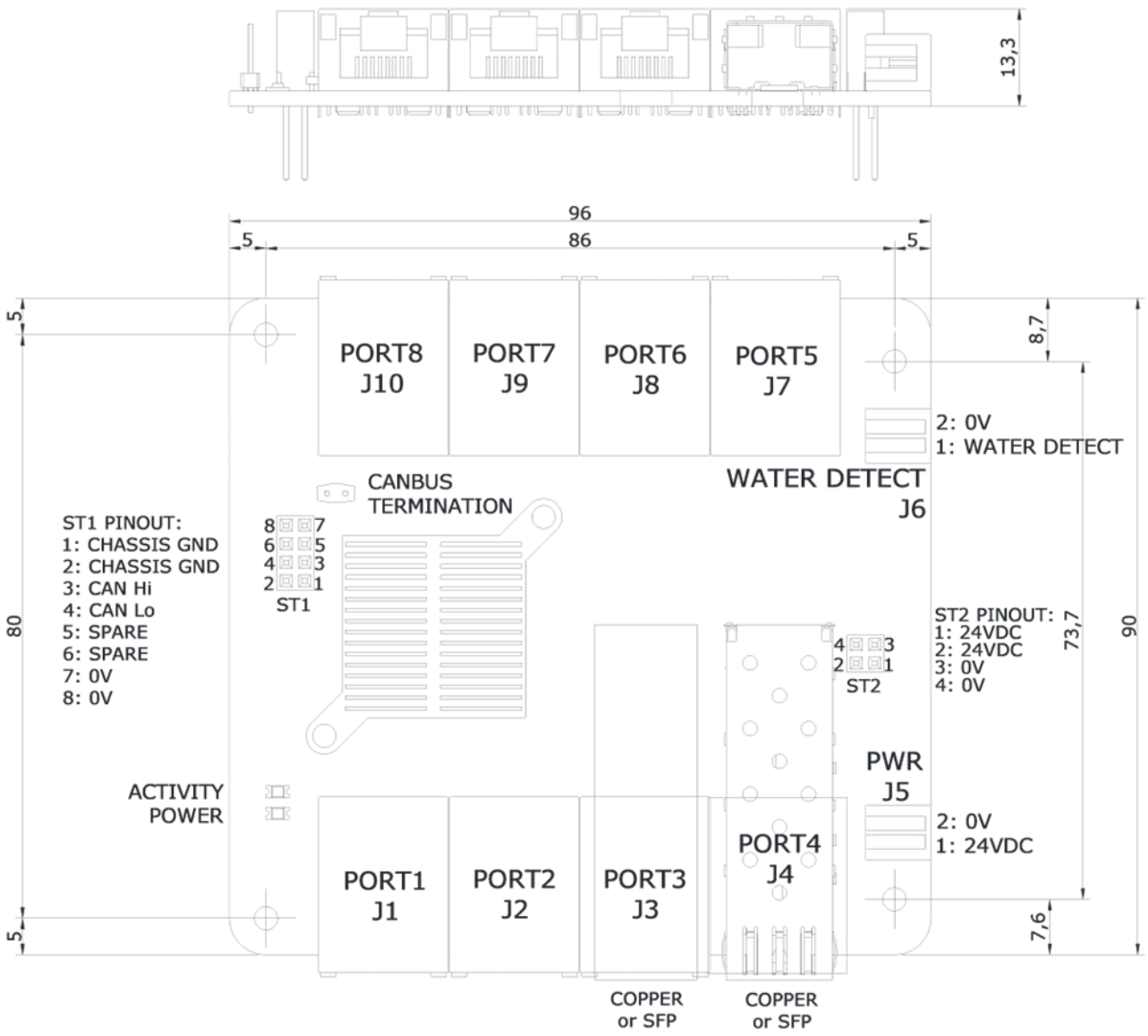
3.4. ORDERING

Ixys Part Number	Description
117996	PCB CS Ethernet Switch 8port
117997	PCB CS Ethernet Switch 8port w/ 1sfp slots
117998	PCB CS Ethernet Switch 8port w/ 2sfp slots

3.5. ACCESSORIES

Ixys Part Number	Description
100040	Connector – 2 Way Cable contact Wago 733-102
107847	SFP 1Gbps Single-fiber Tx1310nm Rx1550
109060	SFP 1Gbps Single-fiber Tx1550nm Rx1310
118780	SFP 2.5Gbps Single-fiber Tx1490nm Rx1550
118781	SFP 2.5Gbps Single-fiber Tx1550nm Rx1490

4. DRAWING


13,3
96
86
5
5
5
80
90
8,7
73,7
7,6
PORT8
J10
PORT7
J9
PORT6
J8
PORT5
J7
2: 0V
1: WATER DETECT
WATER DETECT
J6
CANBUS
TERMINATION
ST1 PINOUT:
1: CHASSIS GND
2: CHASSIS GND
3: CAN Hi
4: CAN Lo
5: SPARE
6: SPARE
7: 0V
8: 0V
8 7
6 5
4 3
2 1
ST1
ST2 PINOUT:
1: 24VDC
2: 24VDC
3: 0V
4: 0V
4 3
2 1
ST2
PWR
J5
2: 0V
1: 24VDC
ACTIVITY
POWER
PORT1
J1
PORT2
J2
PORT3
J3
PORT4
J4
COPPER
or SFP
COPPER
or SFP

5. OPERATION

5.1. NORMAL OPERATION

The ports are by default setup for auto negotiation and there is no need for any Modbus communication for simple switching purposes. Readout of diagnostic data like water alarm, voltage monitoring and port status are done by Modbus UDP or Modbus TCP protocol according to register list in chapter 7. It is also possible to write parameters by the same protocols.

5.2. SETUP

If the switch is stacked to other Ixys CS range boards, then make sure the “CAN-Bus Termination” jumper is attached on at least one of the boards.

5.3. TROUBLESHOOTING / FAULTFINDING

Preliminary fault isolation Check

- ✓ The electrical connections are correct as described in drawing in chapter 4.

Trouble shooting		
Symptom	**Possible Causes**	**Remedy**
No communication with switch management	• No power to board. • Wrong IP address being used. • Port used is not member of VLAN ID1	• Be sure power in a range from 8 – 30VDC is provided to the board. • Verify correct IP address being used. • Use another port that is member of VLAN ID1
Unstable detection and communication with attached IO boards	• No termination on CAN-Bus between the boards.	• Add Jumper to the “CAN-Bus Termination” header pins.

6. COMMUNICATION PROTOCOL

6.1. MODBUS TCP/UDP

Default IP address	10.0.37.239
Default Modbus Node	1
Modbus port	502

6.2. HEARTBEAT

Heartbeat messages are sent once each second to Multicast IP 255.255.255.255 port 65000. These messages can be detected to see IP address if unknown.

6.3. DATA TYPES

The following table describes the data types used on Ixys boards. For 32bit values two Modbus registers is used where the first is the most significant.

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

7. REGISTERS

7.1. READ REGISTERS

7.1.1. HEADER

Address	Description	Default	Note	Data Type
0	PCB Type	N/A	Ethernet Switch Type = 45	UINT16
1	Serial Number	N/A		UINT16
2	Firmware Version	N/A		UINT16
3	Status	N/A	Bit0 = Reserved Bit1 = Water Alarm	UINT16
4	Modbus Port	502		UINT16
5	Supply Voltage	N/A	Unit = 0.1V	UINT16
6	Timeout	1000	Milliseconds without communication before Com Fail is triggered. Changes to this register will be stored.	UINT16
7	Slave Address	1	Modbus Slave Address	UINT16
8	Heartbeat	N/A	1Hz counter. Rolls over to zero after 65535	UINT16
9	Reserved	N/A		UINT16

7.1.2. INPUTS

Address	Description	Note	Data Type
10	Switch Core Temperature	Unit = 1°C	UINT16
11	Switch Ambient Temperature	Unit = 1°C	UINT16
12	Reserved		UINT16
13	Reserved		UINT16
14	Port 1 State	0=Nolink,1=Disabled/Blocked, 2=Listen, 3=Learning, 4=Forward	UINT16
15	Port 1 Spare		UINT16
16	Port 1 Speed	Speed in Mbps + 1 if Full Duplex	UINT16
17	Port 1 InBytes LSB	Successful RX Bytes LSB	UINT32
18	Port 1 InBytes MSB	Successful RX Bytes MSB	
19	Port 1 OutBytes LSB	Successful TX Bytes LSB	UINT32
20	Port 1 OutBytes MSB	Successful TX Bytes MSB	
21-23	Port 1 Reserved		UINT16
24-93	Port 2-8 Equal to port 1		
94	SFP Port 3 Wavelength	Unit = 1nm	UINT16
95	SFP Port 3 Temperature	Unit = 0.1°C	UINT16
96	SFP Port 3 Voltage	Unit = 1mV	UINT16
97	SFP Port 3 Tx Bias	Unit = 10uA	UINT16
98	SFP Port 3 TxPower	Unit = 0.01dBm	INT16
99	SFP Port 3 RxPower	Unit = 0.01dBm	INT16
100-103	Reserved		UINT16
104-109	SFP Port 4 Equal to SFP Port 3		
110-121	Reserved		UINT16
122-499	Additional IO board Inputs	See Expansion PCB Register Document: ICS-SW-PRT-0005	

7.2. WRITE REGISTERS

7.2.1. OUTPUTS

- All Output registers from 500 to 553 and 800 to 1399 are non-volatile and stored on change except for Port Monitoring and disabling that are both reset to zero at reboot.

Address	Description	Default	Note	Data Type
500	Monitor Port	0	Port number for monitoring ingress or egress frames on other ports	UINT16
501	Port 1 Disable	0	Bit 0 => Port Disable Bit 1 => Ingress Monitoring Bit 2 => Egress Monitoring (all off at restart)	UINT16
502	Port 1 Rate	0	0 => Auto-negotiate 1 => Auto-negotiate (1Gbps advertising disabled) 2 => Auto-negotiate (100Mbps advertising disabled) 3 => Auto-negotiate (1Gbps & 100Mbps advertising disabled) 10 => 10mbps 100 => 100mbps 1000 => 1000mbps	UINT16
503	Port 1 Egress Multicast Enable	3	0 => Block unknown multicast and unicast 1 => Block multicast 2 => Block unknown unicast 3 => Egress all	UINT16
504	Port 1 Reserved	0		UINT16
505	Port 1 Duplex	0	0 => Half-Duplex 1 => Full Duplex	UINT16
506-540	Port 2-8 Equal as port 1	N/A		
541-553	Spare	N/A		UINT16
554-799	Additional IO board Outputs	N/A	See Expansion PCB Register Document: 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)	

7.3. READ/WRITE REGISTERS

7.3.1. IO BOARDS

Enter the IP address in a web browser and press the “Node Scan” button on the web page to detect attached nodes and add registers for the IO`s on the attached nodes. Press the “Save” button to store the Node list to non-volatile memory. A node scan takes ten seconds. Node 0 is the Ethernet switch itself.

The maximum number of external nodes is 18. Registers for Node 19 are for Nodes outside range (1-18) or duplicate Node numbers. See 6.3.3 for more information.

Address	Description	Note	Data Type
1400-1418	Node 0 – 18 Type	Type number of node	UINT16
1420-1438	Node 0 – 18 Serial Number	Resets to zero if lost connection with Node	UINT16
1440-1458	Node 0 – 18 Inputs/Outputs	Byte 0 = Number of Input words Byte 1 = Number of Output words Zero until “Node Scan” Performed in web page	UINT16
1460-1478	Node 0 – 18 Firmware Version		UINT16

7.3.2. IO BOARD SETTING CHANGE

Registers for reading and writing of setting parameters in the attached IO boards. Write to registers 1480-1486 first and then run 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 (see table in 7.3.4)	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

7.3.3. DETECTION OF NEW NODE

When a new node with Node-ID outside the range of 1-18 or same Node-ID as existing node, the following registers will be populated with information needed to program a new Node-ID by setting change (Ref.: 6.3.2) of index 0. Be aware that any Ixys boards with jumpers or rotary hex switch set to any Node-ID above 0 will be overridden at power reset to the physically set Node-ID.

Address	Description	Note	Data Type
1419	New Unknown Node - Type	Type number of New Node detected with node ID outside range (1-18) or equal to existing Node in list	UINT16
1439	New Unknown Node - Serial	Serial number of New Node detected with node ID outside range (1-18) or equal to existing Node in list	UINT16
1459	New Unknown Node - Node-ID	Node-ID of New Node detected with node ID outside range (1-18) or equal to existing Node in list	UINT16
1479	New Unknown Node - Version	Firmware Version of New Node detected with node ID outside range (1-18) or equal to existing Node in list	UINT16

7.3.4. STANDARD SETTING INDEXES

For board specific settings, please see Expansion PCB Register Document: ICS-SW-PRT-0005.

Index	Description	Note
0	Node-ID	Change Node-ID here if not set by jumpers or rotary hex switch on board
1	Serial Number	Do not change unless told by Ixys
2	Interval	Interval in milliseconds between transmitted CAN-Messages from the Node. This is overrided by the network switch