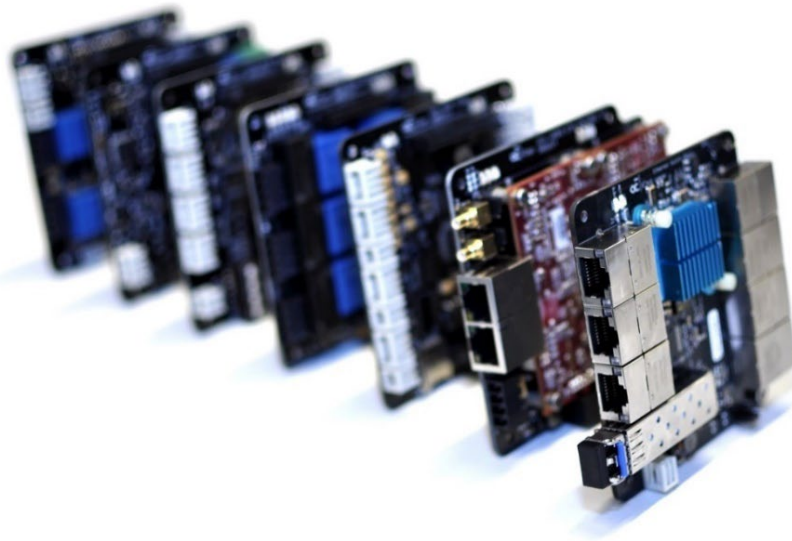




# REGISTER LIST



<b>Equipment Description</b>	Expansion PCBs for Ixys Control System
<b>Ixys Part Number:</b>	100447, 100144, 101629, 100734, 100912, 101481, 100751, 100143, 119018

<b>Document No.:</b>	ICS-SW-PRT-0005	<b>Document Name.:</b>	Register List
<b>Prepared</b>		<b>Checked</b>	<b>Approved</b>
VHA		OMH	SHA

## REVISION HISTORY

---

Published	Revision	Revision reason	Revised by
30.11.2017	A	Issued for release	VHA
02.08.2018	B	Updated PCB PWM Settings	VHA
18.12.2018	C	Updated PCB CPU Registers	VHA
03.11.2022	D	Updated PCB DAQ Counter Registers	VHA
23.05.2023	E	Added GFD bit to 101481 and Encoder Config setting to 101629	VHA
14.06.2023	F	Added 100751, 100143, 100144	VHA
09.10.2023	G	Added PN 101481	VHA
26.10.2023	H	Added default setting values	VHA
04.03.2024	I	Added PN 119018	VHA

**TABLE OF CONTENTS**

---

1. INTRODUCTION..... 4  
 1.1. GENERAL NOTES ..... 4  
 1.2. PURPOSE AND SCOPE ..... 4  
 1.3. ABBREVIATIONS ..... 4  
 1.4. SUPPLIER CONTACT INFORMATION ..... 4  
 2. COMMUNICATION PROTOCOL ..... 5  
 2.1. NODE ID ..... 5  
 2.2. DATA TYPES ..... 5  
 3. REGISTERS..... 6  
 3.1. PN: 100447- PCB CS PWM ..... 7  
 3.1.1. INPUTS ..... 7  
 3.1.2. OUTPUTS ..... 7  
 3.1.3. SETTINGS ..... 7  
 3.2. PN: 100144 - PCB CS TRISTATE ..... 8  
 3.2.1. OUTPUTS ..... 8  
 3.3. PN: 101629 - PCB CS DAQ ..... 9  
 3.3.1. INPUTS ..... 9  
 3.3.2. SETTINGS ..... 9  
 3.4. PN: 100734 - PCB CS RELAY/GFD ..... 10  
 3.4.1. INPUTS ..... 10  
 3.4.2. OUTPUTS ..... 10  
 3.4.3. SETTINGS ..... 10  
 3.5. PN: 100912 - PCB CS MOTION REFERENCE..... 11  
 3.5.1. INPUTS ..... 11  
 3.5.2. SETTINGS ..... 11  
 3.6. PN: 101481 - PCB CS 3PHASE ..... 12  
 3.6.1. INPUTS ..... 12  
 3.6.2. OUTPUTS ..... 12  
 3.6.3. SETTINGS ..... 12  
 3.7. PN: 100751 - PCB CS 24V PSU ..... 13  
 3.7.1. INPUTS ..... 13  
 3.8. PN: 100143 - PCB CS CPU ..... 14  
 3.8.1. INPUTS ..... 14  
 3.8.2. OUTPUTS ..... 14  
 3.8.3. SETTINGS ..... 14  
 3.9. PN: 119018 - PCB CS 8CH ANALOGUE OUT..... 15  
 3.9.1. OUTPUTS ..... 15

## 1. INTRODUCTION

### 1.1. GENERAL NOTES

This document outlines and defines the Modbus Registers offsets for communication with the Ixys Control System Expansion Boards.

### 1.2. PURPOSE AND SCOPE

The purpose of this list is to give instructions to read sensor inputs, set outputs and read/write parameters in the Control System Expansion PCBs supplied by Ixys AS.

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

### 1.3. ABBREVIATIONS

Abbreviation	Description
<b>PCB</b>	Printed Circuit Boards
<b>EEPROM</b>	Electric Erasable Read Only Memory
<b>PWM</b>	Pulse Width Modulation
<b>ADC</b>	Analog to Digital Converter
<b>GFD</b>	Ground Fault Detection

### 1.4. SUPPLIER CONTACT INFORMATION

Ixys AS

Langmyra 11

N-4344 Bryne

Norway

+47 51 42 22 22

[post@ixys.no](mailto:post@ixys.no)

[www.ixys.no](http://www.ixys.no)

## 2. COMMUNICATION PROTOCOL

### 2.1. NODE ID

The Node number for the expansion boards are set by jumpers on the board and is read at startup (reset required if jumpers changed). Four jumpers represent bit 0-3 of node number and therefore the node number range is 0-15. When Node number 0 is set the board reads its Node-ID from programmed value in EEPROM settings register. On newer boards the jumpers have been replaced by a rotary hex switch where the Node-ID can be selected by using a flat screwdriver.

### 2.2. 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 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

### 3. REGISTERS

The addresses below are offset addresses and they will populate the area defined in the Master for expansion nodes Inputs and Outputs. The lowest Node number will use the first expansion node registers in the master and the next higher node number will use the next available expansion registers after the registers consumed by the first node.

**3.1. PN: 100447– PCB CS PWM**

Type Number: 17

**3.1.1. INPUTS**

Address	Description	Note	Data Type
0	Input 1	Raw 16bit ADC value where 12500 = ~4 mA and 62700 = ~20 mA	UINT16
1-7	Input 2 - 8		UINT16

**3.1.2. OUTPUTS**

Address	Description	Note	Data Type
0	Output 1A	The PWM Duty cycle from 0-100% (0-65535)	UINT16
1	Output 1B		UINT16
2-11	Output 2A – 6B		UINT16

**3.1.3. SETTINGS**

Refer to user manual for the applicable master to adjust any setting parameter.

Index	Description	Default	Note	Data Type
3	PWM Frequency	500	Common setting of frequency for all PWM outputs (40-2000Hz)	UINT16

### 3.2. PN: 100144 – PCB CS TRISTATE

Type Number: 33

#### 3.2.1. OUTPUTS

Address	Description	Note	Data Type
0	Relay Output	Bit 0 = Relay 1 On, Bit 1= Relay 2 On etc..	UINT16
1	Tristate 1-8	Bit 0 = Tristate 1 Low, Bit 1 = Tristate 1 High etc..	UINT16
2	Tristate 9-16		UINT16
3	Tristate 17-24		UINT16



**3.3. PN: 101629 – PCB CS DAQ**

Type Number: 18

**3.3.1. INPUTS**

Address	Description	Note	Data Type
0	Input 1	Raw 16bit ADC value.  For current input: 12500 = ~4 mA 62700 = ~20 mA  For voltage input: 0 = 0 V 65535 = 10 V	UINT16
1-7	Input 2 - 8		UINT16
8	Digital Input States High	Bit 0 = Digital input 1 pulled high, Bit 1 = Input 2 ...	UINT16
9	Digital Input States Low	Bit 0 = Digital input 1 pulled low, Bit 1 = Input 2 ...	UINT16
10	Spare		UINT16
11	Spare		UINT16
12	Counter 1 Total LSB	Total number of pulses counted by the two digital pulse counters	INT32
13	Counter 1 Total MSB		INT32
14	Counter 2 Total LSB		
15	Counter 2 Total MSB		
16	Counter 1 Per Minute LSB	Calculated number of pulses per minute. Value returns to zero after 3seconds with no pulse.	REAL32
17	Counter 1 Per Minute MSB		REAL32
18	Counter 2 Per Minute LSB		
19	Counter 2 Per Minute MSB		

**3.3.2. SETTINGS**

Refer to user manual for the applicable master to adjust any setting parameter.

Index	Description	Default	Note	Data Type
1490	Encoder #1 Type	0	0 = NPN 1 = PNP	UINT16
1491	Encoder #1 Reserved	0		UINT16
1492	Encoder #1 Single/Dual	1	0 = Single Input (uses only input #1) 1 = Dual Input	UINT16
1493	Encoder #1 Input No #1	0	Default to 0 for Digital Input 1 as source	UINT16
1494	Encoder #1 Input No #2	1	Default to 1 for Digital Input 2 as source	UINT16
1495	Encoder #2 Type	0	0 = NPN 1 = PNP	UINT16
1496	Encoder #2 Reserved	0		UINT16
1497	Encoder #2 Single/Dual	1	0 = Single Input (uses only input #1) 1 = Dual Input	UINT16
1498	Encoder #2 Input No #1	2	Default to 2 for Digital Input 3 as source	UINT16
1499	Encoder #2 Input No #2	3	Default to 3 for Digital Input 4 as source	UINT16

### 3.4. PN: 100734 – PCB CS RELAY/GFD

Type Number: 5

#### 3.4.1. INPUTS

Address	Description	Note	Data Type
0	Relay 1 Current	Current in mA	UINT16
1	Relay 1 GFD	Ground fault measurement in Kohm. Values above 1 Kohm are beyond range and are indicated with 2 Kohm	UINT16
2	Relay 2 Current		UINT16
3	Relay 2 GFD		UINT16
4	Relay 3 Current		UINT16
5	Relay 3 GFD		UINT16
6	Relay 4 Current		UINT16
7	Relay 4 GFD		UINT16
8	Relay 5 Current		UINT16
9	Relay 5 GFD		UINT16
10	Relay 6 Current		UINT16
11	Relay 6 GFD		UINT16
12	On/Off Status	Relay status feedback. Bit 0 = Relay 1, Bit 1 = Relay 2 ...	UINT16
13	Trip Status	Over current Trip. Bit 0 = Relay 1, Bit 1 = Relay 2 ...	UINT16
14	Spare		UINT16
15	Spare		UINT16

#### 3.4.2. OUTPUTS

Address	Description	Note	Data Type
0	Relay On/Off and Trip Reset	Bit 0-5 = Relay On/Off, Bit 8-13 = Relay Trip Reset	UINT16
1	GFD Activation	Bit 0-5 = GFD Measurement On/Off *	UINT16
2-7	Trip Level	Trip Level in mA. Fuse trip function is deactivated when zero trip level	UINT16

\* The Relay boards synchronize between each other and selects one channel at the time for GFD measurement to eliminate interference when connected to the same power supply. The less activated GFD channels the faster the update rate (about 0.5sec per channel).

#### 3.4.3. SETTINGS

Refer to user manual for the applicable master to adjust any setting parameter.

Index	Description	Default	Note	Data Type
100-105	Startup Trip Level	15000	Trip Level in mA. Fuse trip function is deactivated when zero trip level	UINT16
106	Fuse Configuration CH1	0	Bit 0 = Short circuit Trip Disabled Bit 1 = Fast fuse active Bit 2 = Lock trip limit to startup trip level	UINT16
107-111	Fuse Configuration CH2-6	0		UINT16
112	GFD Configuration	0	Bit 0 = Use Legacy Scale (260-2048 = 1Mohm - 0ohm) Bit 1 = Solo mode (sequence only the 6ea channels on this board and ignore other Relay boards to speed up measurement)	UINT16

**3.5. PN: 100912 – PCB CS MOTION REFERENCE**

Type Number: 7

**3.5.1. INPUTS**

Address	Description	Note	Data Type
0	Heading	In degrees multiplied by 10	INT16
1	Roll	In degrees multiplied by 10	INT16
2	Pitch	In degrees multiplied by 10	INT16
3	Reserved		
4	Rate X		INT16
5	Rate Y		INT16
6	Rate Z		INT16
7	Calibration Status	0 = Calibrated compensation not activated 1 = Compensation Activated >1 = Calibration ongoing and number of seconds left	UINT16

**3.5.2. SETTINGS**

Refer to user manual for the applicable master to adjust any setting parameter.

Index	Description	Default	Note	Data Type
100	Sensor Orientation	0	0, 90, 180 or 270 degrees clockwise offset from forward direction	UINT16
101	Magnetic Compensation	0	0=Off, 1=UseCompensation, 2=Reset(takes 90sec) To reset run with Parameter=2 - wait and rotate about 90sec in all axes and then this value returns to 1 when finished calibration.	UINT16

**3.6. PN: 101481 – PCB CS 3PHASE**

Type Number: 11

**3.6.1. INPUTS**

Address	Description	Note	Data Type
0	GFD	Ground fault measurement in Kohm	UINT16
1	Phase 1 Current	Phase 1 Current in mA	UINT16
2	Phase 2 Current	Phase 2 Current in mA	UINT16
3	Phase 3 Current	Phase 3 Current in mA	UINT16
4	Status	Bit 0 = Output On Bit 1 = Output Direction Bit 2 = Output Over Current Tripped Bit 3 = Output CW End Stop Switch Activated Bit 4 = Output CCW End Stop Switch Activated	UINT16
5-7	Reserved		

**3.6.2. OUTPUTS**

Address	Description	Note	Data Type
0	Relay On/Off, Direction and Trip Reset	Bit 0 = On/Off Bit 1 = Output Direction (Phase 2 and 3 are crossed) Bit 2 = Relay Trip Reset Bit 3 = Activate Ground Fault Measurement	UINT16
1	Output Trip Limit	Trip Level in mA. Fuse trip function is deactivated when zero trip level	UINT16
2-3	Reserved		

**3.6.3. SETTINGS**

Refer to user manual for the applicable master to adjust any setting parameter.

Index	Description	Default	Note	Data Type
100	Output Trip Limit	65535	The trip limit at startup	UINT16
101	Fast Fuse	0	2 = Fast Fuse Other = Slow Fuse (default)	UINT16

**3.7. PN: 100751 – PCB CS 24V PSU**

Type Number: 8

**3.7.1. INPUTS**

Address	Description	Note	Data Type
0	5 V Current	5 V Current measurement (scaled to milliampere)	UINT16
1	5 V Voltage	5 V Voltage measurement (scaled to millivolt)	UINT16
2	24 V Current	24 V Current measurement (scaled to milliampere)	UINT16
3	24 V Voltage	24 V Voltage measurement (scaled to millivolt)	UINT16

**3.8. PN: 100143 – PCB CS CPU**

Type Number: 10

**3.8.1. INPUTS**

Address	Description	Note	Data Type
0	Input 1	Raw 16bit ADC value.  For current input: 12500 = ~4 mA 62700 = ~20 mA  For voltage input: 0 = 0 V 65535 = 10 V	UINT16
1-7	Input 2 - 8		UINT16
8	Temperature	Ambient Temperature in Celsius	UINT16
9	Water Detect	0 = No Water 1 = Water Detected	UINT16
10-11	Reserved		

**3.8.2. OUTPUTS**

Address	Description	Note	Data Type
0	Output 1	For 0V to +10V output (Analog Output Type configured to 0) 0-65535 = 0 V to +10 V  For -10V to +10V output (Analog Output Type configured to 1) 0 to 32767 = 0 V to +10 V -32768 to 0 = -10 V to 0 V	UINT16  INT16
1-7	Output 2-8		

**3.8.3. SETTINGS**

Index	Description	Default	Note	Data Type
1490	Analog Output Type	0	0 = 0 to 10 V 1 = -10 to +10 V	UINT16

**3.9. PN: 119018 – PCB CS 8CH ANALOGUE OUT**

Type Number: 47

**3.9.1. OUTPUTS**

Address	Description	Note	Data Type
0	Output 1	0 to 32767 = 0 V to +10 V -32768 to 0 = -10 V to 0 V	INT16
1-7	Output 2-8		