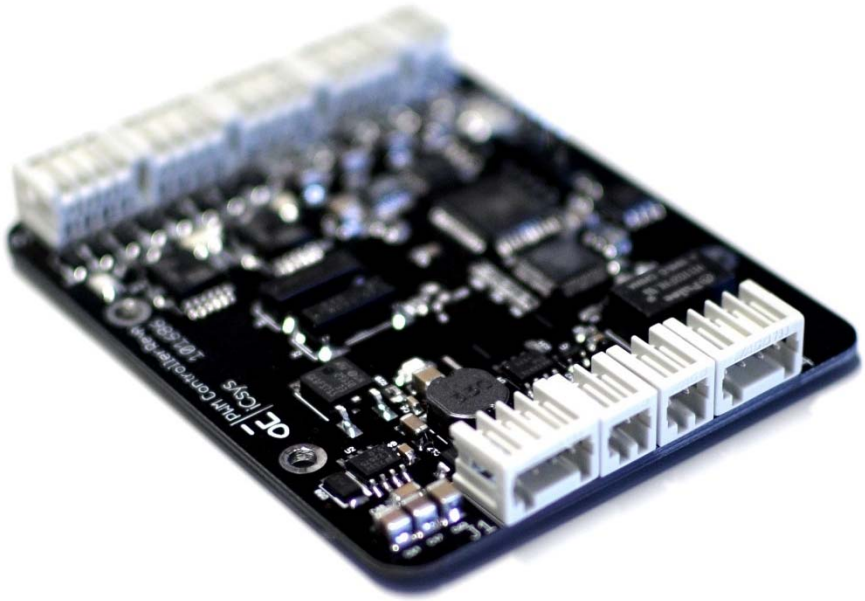
REGISTER LIST



Equipment Description	2CH PWM PCB
iCsys Part Number:	101686

Document No.:	101686-ICS-SW-PRT-001	**Document Name.:**	Register List
Published	**Revision number**	**Revision reason**	**Revised by**
25.09.2018	B	Changed Inputs to REAL	VHA
20.08.2018	A	Issued for release	VHA
Prepared		**Checked**	**Approved**
VHA		SHA	EME

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1. INTRODUCTION

1.1. GENERAL NOTES

This document outlines and defines the Modbus Registers for communication with the iCsys 2CH PWM circuit board.

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 2CH PWM PCB supplied by iCsys 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
IP	Internet Protocol
EEPROM	Electric Erasable Programmable Read Only Memory

1.4. SUPPLIER CONTACT INFORMATION

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2. COMMUNICATION PROTOCOL

2.1. MODBUS RTU

The RS485 port has termination resistor of 120 ohms on the board (R62) that must be removed if more than two boards will be connected on the same bus.

Default Baudrate	115 200 bps
Data bits	8
Parity	None
Stop bits	2

2.2. MODBUS TCP/UDP

Default IP address	10.0.37.248
Default Modbus Node	1
Modbus port	502

2.3. 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.

2.4. DATA TYPES

The following table describes the data types used on iCsys 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

3. REGISTERS

3.1. READ REGISTERS

3.1.1. HEADER

Address	Description	Note	Data Type
0	PCB Type	2CH PWM Type = 23	UINT16
1	Serial Number		UINT16
2	Firmware Version		UINT16
3	Status	Bit 0 = N/A, Bit 1 = Water Alarm	UINT16
4	Modbus Port (UDP/TCP)		UINT16
5	Supply Voltage	Unit = 0.1V	UINT16
6	Timeout	Milliseconds without communication before Com Fail is triggered. Changes to this register will be stored.	UINT16
7	Slave Address	Modbus Slave Address. Changes to this register will be stored.	UINT16
8	Heartbeat	1Hz counter. Rolls over to zero after 65535	UINT16
9	Serial Baudrate (RTU)	The Baudrate is indicated by a single digit. Changes to this register will be stored: 0 = 9600 1 = 19200 2 = 28800 3 = 38400 4 = 57600 5 = 115200	UINT16

3.1.2. INPUTS

Address	Description	Note	Data Type
10	Input 1 Scaled MSB	Input raw value scaled according to input settings registers and presented as floating-point number.	REAL32
11	Input 1 Scaled LSB		
12	Input 1 Raw	16-bit value where 4mA = 12500, 20mA = 62700	UINT16
13-21	Input 2-4	Same as register 10-12 for input 2 - 4	
22	Encoder Total MSB	Digital input 1 and 2 share the same pulse counter and will count both up and down if used as incremental encoder. If only the first input of the digital pair is pulsed the counter will only count up and if only the second digital input is used the counter will count down. This is Input 5 in the scaling registers.	REAL32
23	Encoder Total LSB		
24	Digital Input 1 State	0 = Input Low, 1 = Input High	UINT16
25	Encoder Actual MSB	Actual value per minute for the encoder (example: Liters per minute for flowmeter). This is input 6 in the scaling registers	REAL32
26	Encoder Actual LSB		
27	Digital Input 2 State	0 = Input Low, 1 = Input High	UINT16
28	Coil Status Open Circuit	Bit 0 = Coil 1A Open Circuit Bit 1 = Coil 1B Open Circuit Bit 2 = Coil 2A Open Circuit Bit 3 = Coil 2B Open Circuit	UINT16
29	Coil Status Short Circuit	Bit 0 = Coil 1A Short Circuit Bit 1 = Coil 1B Short Circuit Bit 2 = Coil 2A Short Circuit Bit 3 = Coil 2B Short Circuit	UINT16
30	Regulator Status	Bit0 = Regulator Active Bit1 = N/A Bit2 = N/A Bit3 = KP Active Bit4 = KI Active Bit5 = KD Active	UINT16

31	Regulator Setpoint MSB	Feedback of the regulator setpoint	REAL32
32	Regulator Setpoint LSB		
33	Regulator Error MSB	Equal to Setpoint minus Input	REAL32
34	Regulator Error LSB		
35	Regulator Output	Output value from the regulator	UINT16
36	Regulator P-Effect	The Proportional effect the regulator has on the output	INT16
37	Regulator I-Effect	The Integral effect the regulator has on the output	INT16
38	Regulator D-Effect	The Derivative effect the regulator has on the output	INT16

3.2. WRITE REGISTERS

3.2.1. OUTPUTS

Address	Description	Note	Data Type
200	Output 1A Active	Set to 1 for output to become active	UINT16
201	Output 1A Value	16-bit value (0-65535) representing the PWM duty cycle from 0 to 100%	UINT16
202	Output 1B Active		UINT16
203	Output 1B Value		UINT16
204	Output 2A Active		UINT16
205	Output 2A Value		UINT16
206	Output 2B Active		UINT16
207	Output 2B Value		UINT16
208	Regulator Active	0=Disabled 1=Active If this register is set to 1 then selected output for regulator is controlled by the regulator to reach the setpoint. The selected regulator input Scaled value is used as regulator feedback.	UINT16
209	Regulator Setpoint MSB	Setpoint for the regulator	REAL32
210	Regulator Setpoint LSB		
211	Encoder Reset	0=No Action, 1=Set Encoder Total to Zero	UINT16

3.3. READ/WRITE REGISTERS

These registers are stored in non-volatile memory when changed.

3.3.1. INPUT SETTINGS

Address	Description	Note	Data Type
300	Input 1 Type	0 = Analog Input 1 = Digital Input This parameter should only be changed on inputs with option to select input type and there is none on the 2CH PWM PCB. Input 1-4 are 4-20mA inputs and 5-6 are the digital inputs.	UINT16
301	Input 1 Raw Max	Raw value corresponding to Scaled Max value	UINT16
302	Input 1 Raw Min	Raw value corresponding to Scaled Min value	UINT16
303	Input 1 Scaled Max	A high reference for calibration of input scaling (typically sensor maximum)	INT16
304	Input 1 Scaled Min	A low reference for calibration of input scaling (typically zero)	INT16
305	Input 1 Reserved		UINT16
306	Input 1 Reserved		UINT16
307	Input 1 Reserved		UINT16
308	Input 1 Digital Counter Delay	Delay on digital counter in milliseconds to avoid bouncing	UINT16
309	Input 1 Reserved		UINT16
310-359	Input 2-6		

3.3.2. OUTPUT SETTINGS

Address	Description	Note	Data Type
500	Output 1A Reserved		UINT16
501	Output 1A Frequency	PWM Frequency from 40 to 2000Hz (restart PCB for effect)	UINT16
502	Output 1A Reserved		UINT16
503	Output 1A Reserved		UINT16
504	Output 1A Minimum	Used by regulator for output scaling	UINT16
505	Output 1A Maximum	Used by regulator for output scaling	UINT16
506	Output 1A Reserved		UINT16
507	Output 1A Reserved		UINT16
508	Output 1A Reserved		UINT16
509	Output 1A Reserved		UINT16
510-539	Output 1B – 2B		

3.3.3. REGULATOR SETTINGS

Address	Description	Note	Data Type
800	KP MSB	Proportional effect by regulator	REAL32
801	KP LSB		
802	KI MSB	Integral effect by regulator	REAL32
803	KI LSB		
804	KD MSB	Derivative effect by regulator	REAL32
805	KD LSB		
806	Threshold MSB	Not implemented, but reserved for future	REAL32
807	Threshold LSB		
808	KP Active	0=Disabled, 1=Active	UINT16
809	KI Active	0=Disabled, 1=Active	UINT16
810	KD Active	0=Disabled, 1=Active	UINT16
811	Input Min	Used as lower limit to setpoint	INT16
812	Input Max	Used as upper limit to setpoint	INT16
813	Regulator Output Number	0=1A, 1=1B, 2=2A, 3=2B	INT16
814	Regulator Input Number	0-3 = Input 1-4 used as regulator feedback	INT16
815	Regulator Limit Input Number	Input used to limit the maximum setpoint (-1 = Limit Disabled)	INT16