MODBUS TI-SIII-M-LP200

BARRIER™ TI UV SYSTEM SPECTRA 3 LP200 MEMBRANE

MODBUS MANUAL

Revision 1
Date 08/03/2024

evoqua
WATER TECHNOLOGIES

Document History:

ISSUE	CREATION DATE	CREATED BY
1	08/03/2024	George Foster

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MODBUS Communication

INTRODUCTION

The Spectra UV disinfection system has built in Modbus RTU for control and monitoring of the systems performance parameters.

This document is aimed at end users and system integrators of the Spectra UV disinfection system and covers the following:

- Modbus implementation
- Modbus maintenance
- Modbus debugging

SUPPORTED INTERFACE

Spectra works as a slave device and is implemented in accordance with the EIA/TIA-485 (RS-485) standard, supporting the following:

- 2 or 4 wire interface
- Odd, even and no parity
- Baud rates 9600 to 115200
- One or two stop bits

PHYSICAL CONNECTION

Cable Connection

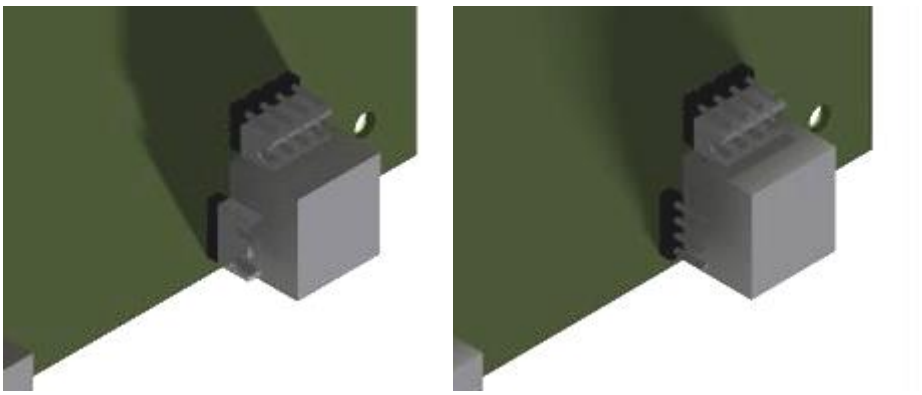
Connection to the Spectra is via the Modbus Slave port on the ATUV-1010 motherboard.

An RJ45 connection is required with the following pin out:

MODBUS SLAVE PIN OUT		
1	Rx+	Receive positive
2	Rx-	Receive negative
3		
4	Tx-	Transmit negative
5	Tx+	Transmit positive
6		
7		
8	Ground	Reference ground

2 / 4 wire selection

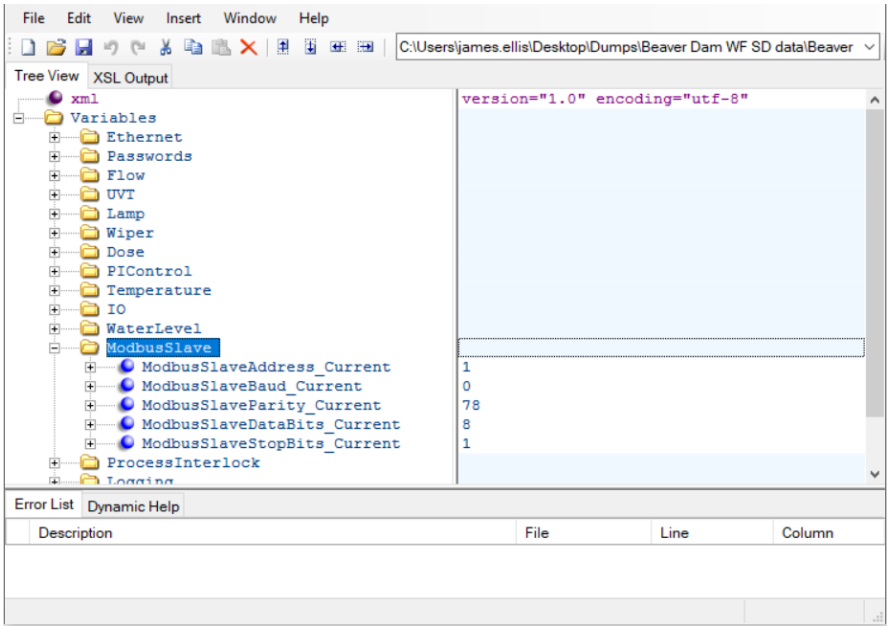
Both 2 and 4 wire interfaces are supported, this is selected using a 4-way header on the ATUV-1010. No jumpers indicate 4 wire interface, for 2 wire interface 2 jumpers should be fitted.



ATUV-1010 with (left) and without jumpers (right)

DATA TRANSMISSION

The following parameters are set from the config.xml on the SD card and are found in the ModbusSlave directory.



Slave Address

MODBUSSLAVEADDRESS_CURRENT	
Description: Used to set this slave address of the Spectra unit.	
Selectable Values	1 - 99

Data Bits

MODBUSSLAVEDATABITS_CURRENT	
Description: Used to select the number of data bits in the Modbus frame.	
Selectable Values	7
	8

Stop Bits

MODBUSSLAVESTOPBITS_CURRENT	
Description: Used to select the number of stop bits in the Modbus frame.	
Selectable Values	1
	2

Parity

MODBUSSLAVEPARITY_CURRENT		
Description: Used to select the parity checking of the Modbus frame.		
Selectable Values	N (78)	None
	E (69)	Even
	O (79)	Odd

Baud Rate

MODBUSSLAVEBAUD_CURRENT		
Description: Used to select the transmission baud rate.		
Selectable Values	0	115200
	1	57600
	2	38400
	3	19200
	4	9600

MESSAGE STRUCTURE

General Structure

Modbus frames are structured in the following format:

ADDRESS	FUNCTION CODE	DATA	CRC
8 bits	8 bits	N x 8 Bits	16 bits

ADDRESS
Description: Single byte used to identify the slave address

FUNCTION CODE	
Description: Consists of a single byte and is used to tell the address slave what action to perform, the following function codes are supported:	
0x03	Read Holding Registers
0x06	Write Single Register
0x10	Write Multiple Registers

DATA
Description: Multiple bytes containing the actual data

CRC
Description: Consists of 2 bytes which are a result of a cyclic redundancy check calculation performed on the message content.

Read Data

Function code 0x03 and 0x04 requests from the mater should be structured in the following format:

ADDRESS	FUNCTION CODE	DATA		CRC
		REGISTER START ADDRESS	NUMBER OF REGISTERS	
8 bits	0x03	16 bits	16 bits	16 bits

The Spectra will reply to a successful read request in the following format:

ADDRESS	FUNCTION CODE	BYTE COUNT	DATA	CRC
8 bits	0x03	8 bits	N x 8 bits	16 bits

Write Data

Write Single Register

Function code 0x06 frames from the master should be structured in the following format:

ADDRESS	FUNCTION CODE	DATA		CRC
		REGISTER ADDRESS	DATA	
8 bits	0x06	16 bits	16 bits	16 bits

The Spectra will reply to a successful write by sending an echo of the request.

Write Multiple Registers

Function code 0x10 frames from the master should be structured in the following format:

ADDRESS	FUNCTION CODE	DATA				CRC
		REGISTER START ADDRESS	NUMBER OF REGISTERS	BYTE COUNT	DATA	
8 bits	0x10	16 bits	16 bits	8 bits	N x 8 bits	16 bits

The Spectra will reply to a successful write by sending an echo of the request.

DATA STORAGE

The data stored in the Spectra is arranged as a database, which is accessed for read or write using 16-bit words arranged to give access to control, status and configuration data.

Each parameter has an associated Read / Write attribute associated with it. A byte written to a read only address will be ignored with no exception generated. Similarly, a byte read from a write only address will return 0 with no exception generated.

Writing to an undefined address within the allowable data range is ignored; similarly reading an undefined address will return 0. Again, no exception will be generated.

Attempting to write or read data from an area outside the allowable data range will result in the transmission of an exception message.

Changes to data written from the master are actions immediately upon receipt.

FULL REGISTER MAP

ADDRESS	DESCRIPTION	UNITS (DEFAULT)	TYPE	READ / WRITE
46000	Flow Rate	m3/hr (x10)	uint_16	Read
46001	Chamber Temperature	°C (x10)	uint_16	Read
46002	UV Dose	mJ/cm2 (x10)	uint_16	Read
46003	Average UV Intensity	mW/cm2 (x10)	uint_16	Read
46005	System UVT	% (x10)	uint_16	Read
46006	System Power Level	% (x10)	uint_16	Read
46007	Rolling Watchdog		uint_16	Read
46008	System Status	(See example)	uint_16	Read
46009	Fatal Alarms	(See example)	uint_16	Read
46010	Critical Alarms	(See example)	uint_16	Read
46011	Non-Critical Alarms	(See example)	uint_16	Read
46012	System Hours	Hours (÷ 24)	uint_16	Read
46013	Dose Set-point	mJ/cm2 (x 10)	uint_16	Read
46020	System Control	(See example)	uint_16	Read / Write
46021	Comms Flow Rate	m3/hr	uint_16	Read / Write
46022	Comms UVT	% (x10)	uint_16	Read / Write
46023	Power Control mode	(See example)	uint_16	Read / Write
46024	Reset Alarms	0 – No reset 1 – Reset Alarms	uint_16	Read / Write
46030	Lamps in use (1-4)	Bit map (See Example)	uint_16	Read

ADDRESS	DESCRIPTION	UNITS (DEFAULT)	TYPE	READ / WRITE
46035	System Control Mode	0 – Local 1 – Remote 2 - Comms	uint_16	Read
46036	Flow Source	0 – Fixed 1 – Comms 2 – Analogue	uint_16	Read
46037	Dose Units	0 – mJ/cm2 1 – J/m2 2 – J/cm2	uint_16	Read
46038	Flow Units	0 – m3/hr 1 – BPM 2 – l/s 3 – Ml/d 4 – GPM 5 - MGD	uint_16	Read
46039	Intensity Units	0 – mW/cm2 1 – W/m2	uint_16	Read
46040	Temperature Units	0 - °C 1 - °F	uint_16	Read
46041	Lamp Life	Hours	uint_16	Read
46042	Restrike time	Minutes	uint_16	Read
46043	Low Dose Time	Seconds	uint_16	Read
46044	Fixed Flow Rate	m3/hr	uint_16	Read
46045	Flow meter Max	m3/hr	uint_16	Read
46047	UV Dose Set Point	mJ/cm2	uint_16	Read
46048	Dose Alarm Level	mJ/cm2	uint_16	Read
46049	Dose Fault Level	mJ/cm2	uint_16	Read
46050	Fault Temperature	°C	uint_16	Read
46051	Alarm Temperature	°C	uint_16	Read
46052	Power Level	%	uint_16	Read
46053	Auto Restart		uint_16	Read
46056	Restrike Countdown Timer	Seconds (counts down upon lamp(s) extinguishing)	uint_16	Read
47100	UV Intensity 1	mW/cm2 (x100)	uint_16	
47200 – 47203	Lamp 1 Hours to Lamp 4 Hours	Hours	uint_16	Read
47300-47303	Lamp 1 Strikes – Lamp 4 Strikes		uint_16	Read

Register Examples

SYSTEM CONTROL	
Description: Start, Stops & Resets faults present on the system. Note: Spectra requires to be set to Remote to start/stop the system via Comms.	
Address	46020
Type	uint_16
Read / Write	Read / Write
Example	0 - Stop 1 - Start

POWER CONTROL MODE	
Description: Selects the power level of the system.	
Address	46023
Type	uint_16
Read / Write	Read / Write
Example	0 – Full 1 - Variable 2 – Low

LAMPS IN USE	
Description: Indicates the number and order of lamps enabled.	
Address	46030
Units	Y / N
Type	uint_16
Read / Write	Read only
Example	Value of 5 would indicate that lamps 1 and 3 are enabled. (YNYN NNNN NNNN NNNN / 1010 0000 0000 0000)

FATAL ALARMS	
Description: Displays the status of the fatal alarms	
Address	46009
Type	uint_16
Read / Write	Read only
Example	0 – No fatal alarms 1 – I/O Module Communications Watchdog 2 – Local Stop Fault

CRITICAL ALARMS	
Description: Displays the status of the critical alarms	
Address	46010
Type	uint_16
Read / Write	Read only
Example	0 – No critical alarms 1 - I/O modules less than expected 2 – I/O Module not calibrated 4 - SD Card not found 8 - Lamp fault 16 - Chamber temperature fault 32 – Control Panel over temperature 64 – Low UV dose fault 128 – Process Interlock shutdown 256 – Flow Meter Out of Range

NON-CRITICAL ALARMS	
Description: Displays the status of the non-critical alarms	
Address	46011
Type	uint_16
Read / Write	Read only
Example	0 – No non-critical alarms 1 – Process interlock interrupt 2 – Low UV dose alarm 4 – Lamp Approaching end of life 8 – Chamber temperature alarm 16 – Power Loss When running 32 – Manual Wipe Reminder

*Note – Wiper Reminder (32) is classed as a Non-Critical Alarm, this is disabled by default

SYSTEM STATUS	
Description: Displays the overall status of the system.	
Address	46008
Type	uint_16
Read / Write	Read only
Example	0 – Normal Stop 1 – Running 2 – Starting Up 4 – Fatal Fault 8 – Critical Fault 16 – Non-Critical Alarm 32 – Stopped Restrike, Stopped Non-Critical, Stopped Critical, Stopped Fatal, Stopped Process Interlock

For further support please contact your local authorised service provider, or contact our head office in your region:

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