

Modbus TCP

PHU Series

START GUIDE



ISO-9001 CERTIFIED MANUFACTURER

GW INSTEK

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Overview

This document describes the Modbus TCP interface, data format, function codes, and register descriptions for the PHU Series.

The Modbus TCP examples in the Modbus TCP chapter show the complete TCP message structure, including the MBAP header and PDU. The examples in the Register Descriptions chapter show only the Modbus PDU.

- Modbus TCP ADU = MBAP Header + PDU

- PDU = Function Code + Function Data

The PDU is also common to Modbus RTU. Therefore, register examples intentionally omit MBAP header, unit/slave address, and CRC.

Modbus TCP

Introduction

Overview Modbus TCP messages consist of an MBAP header and a PDU. Different from Modbus RTU, Modbus TCP does not include a slave address before the PDU and does not include a CRC at the end of the message.

Modbus TCP is based on Ethernet. The socket server port number is 502 for Modbus master applications.

MBAP header	Transaction ID	Protocol ID	Length	Unit ID
	Byte 0,1	Byte 2,3	Byte 4,5	Byte 6

Function code The following function codes are used by the PHU Modbus TCP interface.

Function code	Description
0x03	Read Holding Registers
0x06	Write Single Register
0x10	Write Multiple Registers

Using Modbus TCP

Overview Use a Modbus TCP master application to communicate with the PHU instrument through the Ethernet interface.

Before sending commands, make sure that the PHU network settings are configured correctly and that the PC can reach the instrument IP address.

- Basic procedure
1.

Connect the PHU rear panel Ethernet port to the network.

2.

Configure the PHU network settings required by the installation, such as IP address, subnet mask, gateway, and DHCP setting.

3.

Open a Modbus TCP master application on the PC.

4.

Connect to the PHU instrument by using the instrument IP address and TCP port 502.

5.

Send a Modbus TCP ADU according to the function code, register address, number of registers, and data format described in this manual.

Function check

This function check uses the Identification register to verify Modbus TCP communication with a PHU instrument.

Function code: 0x03 Start address: 0 Number of registers: 50

Functionality
Check

Request packet:

MBAP header	Function code	Starting registers	Number of registers
0x00 0x18 (Transaction ID)	0x03	0x00 0x00	0x00 0x32
0x00 0x00 (Protocol ID)			
0x00 0x06(Length)			
0x00 (Unit ID)			
MBAP header	Read Holding Registers	Registers address	Account for 50 registers

Response packet:

MBAP header	Function code	Length of data	Data
0x00 0x18 (Transaction ID) 0x00 0x00 (Protocol ID) 0x00 0x67(Length) 0x00 (Unit ID)	0x03	0x00 0x64	0x47 0x57 0x2D 0x49 0x4E 0x53 ... 0x00 0x00 0x00
MBAP header	Read Holding Registers	100 bytes	GW-INS ...

In this example, 0x64 means 100 bytes of data. The response data begins with ASCII bytes such as 0x47 0x57 0x2D 0x49 0x4E 0x53, which represent GW-INS.

PDU Format

Overview The following function codes are used by the PHU Modbus register interface.

Function code	Description
0x03	Read Holding Registers
0x06	Write Single Register
0x10	Write Multiple Registers

Read Holding Registers (FC 0x03)

Request PDU :

Function code	Starting registers	Number of registers
0x03	Byte 1, 2	Byte 3, 4

Response PDU:

Function code	Length of data	Data
0x03	Byte 1	Byte 2.....

Example, read one register at decimal address 3803 ("0x0EDB"):

Request PDU :

Function code	Starting registers	Number of registers
0x03	0x0E 0xDB	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	0x00 0x01

Write Single Register (FC 0x06)

Request PDU :

Function code	Starting registers	Data
0x06	Byte 1, 2	Byte 3, 4

Response PDU:

Function code	Starting registers	Data
0x06	Byte 1, 2	Byte 3, 4

Example, set output ON at decimal address 3803 ("0x0EDB"):

Request PDU :

Function code	Starting registers	Data
0x06	0x0E 0xDB	0x00 0x01

Response PDU:

Function code	Starting registers	Data
0x06	0x0E 0xDB	0x00 0x01

Write Multiple Registers (FC 0x10)

Request PDU:

Function code	Starting registers	Number of registers	Length of data	Data
0x10	Byte 1, 2	Byte 3, 4	Byte 5	Byte 6.....

Response PDU:

Function code	Starting registers	Number of registers
0x10	Byte 1, 2	Byte 3, 4

Example, write IEEE 754 float "1.0" ("0x3F 0x80 0x00 0x00") to decimal address 904 ("0x0388"), two registers:

Request PDU :

Function code	Starting registers	Number of registers	Length of data	Data
0x10	0x03 0x88	0x00 0x02	0x04	0x3F 0x80 0x00 0x00

Response PDU:

Function code	Starting registers	Number of registers
0x10	0x03 0x88	0x00 0x02

Data Format Notes

Overview

This chapter introduces the data package format of each data type and provides examples for reference.

Byte order: All Modbus register addresses and register data examples in this document use big-endian byte order. The most significant byte is transmitted first.

Data type	Data length	Number of registers
char	1 byte per character	Depends on string length
uint16	2 bytes	1
uint32	4 bytes	2
float	4 bytes	2

Char

Character data is returned as ASCII bytes.

Example, read Identification at decimal address 0, 50 registers:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x00 0x00	0x00 0x32

Response PDU:

Function code	Length of data	Data
0x03	0x64	0x47 0x57 0x2D 0x49 0x4E 0x53 ... 0x00 0x00 0x00

In this example, 0x64 means 100 bytes of data. The response data begins with ASCII bytes such as 0x47 0x57 0x2D 0x49 0x4E 0x53, which represent GW-INS.

Uint16

Uint16 uses one Modbus register, two bytes. It is used for normal numeric values, enum values, bit fields, and percent value registers.

Write

Example, write Buzzer ON/OFF Control at decimal address 801 ("0x0321") to value "1":

Request PDU:

Function code	Starting registers	Data
0x06	0x03 0x21	0x00 0x01

Response PDU:

Function code	Starting registers	Data
0x06	0x03 0x21	0x00 0x01

Read

Example, read Buzzer ON/OFF Control:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x03 0x21	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	0x00 0x01

Percent Value Registers

Some uint16 setting and measurement registers are stored as percent values.

Percent value

Item	Formula
Real value	Nominal value * percent value/ 52428
Percent value	52428 * real value / nominal value

Example: For a PHU model with nominal voltage of 200 V, setting the voltage to 100 V requires a percent value of 26214 (0x6666).

Example, write Voltage Setting at decimal address 3800 ("0x0ED8") to percent value "26214" ("0x6666"):

Request PDU:

Function code	Starting registers	Data
0x06	0x0E 0xD8	0x66 0x66

Response PDU:

Function code	Starting registers	Data
0x06	0x0E 0xD8	0x66 0x66

If the nominal voltage is 200 V, the real voltage is:
 $200 * 26214 / 52428 = 100 \text{ V}$

Uint32

Uint32 uses two Modbus registers, four bytes.

Write

Example, write Output ON Delay Time at decimal address 4200 ("0x1068") to data "100" ("0x00000064"), which means "1 s":

Request PDU:

Function code	Starting registers	Number of register	Length of data	Data
0x10	0x10 0x68	0x00 0x02	0x04	0x00 0x00 0x00 0x64

Response PDU:

Function code	Starting registers	Number of register
0x10	0x10 0x68	0x00 0x02

Read

Example, read Output ON Delay Time:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x10 0x68	0x00 0x02

Response PDU:

Function code	Length of data	Data
0x03	0x04	0x00 0x00 0x00 0x64

Float

Float uses two Modbus registers, four bytes. The arithmetic standard for floating-point data is IEEE 754.

Write

Example, write Rising Voltage Slew Rate at decimal address 3901 ("0x0F3D") to "0.1 V/s", IEEE 754 value "0x3D 0xCC 0xCC 0xCD":

Request PDU:

Function code	Starting registers	Number of register	Length of data	Data
0x10	0x0F 0x3D	0x00 0x02	0x04	0x3D 0xCC 0xCC 0xCD

Response PDU:

Function code	Starting registers	Number of register
0x10	0x0F 0x3D	0x00 0x02

Read

Example, read Rising Voltage Slew Rate:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x0F 0x3D	0x00 0x02

Response PDU:

Function code	Length of data	Data
0x03	0x04	0x3D 0xCC 0xCC 0xCD

Exception Code List

The following exception codes are returned when the instrument cannot process a Modbus request normally.

List

Exception Code	Name	Description
00 (0x00)	None	No exception.
01 (0x01)	Illegal function	The function code received in the request is not an authorized action for the instrument.
02 (0x02)	Illegal data address	The data address or data length received in the request is not an authorized address or length for the instrument.
03 (0x03)	Illegal data value	The value in the request data field is not an authorized value for the instrument.
04 (0x04)	Slave device failure	The instrument fails to perform a requested action because of an unrecoverable error.
05 (0x05)	Acknowledge	The instrument accepts the request but needs a long time to process it.
06 (0x06)	Slave device busy	The instrument is busy processing another command. The master must send the request again when the instrument is available.
07 (0x07)	Access denied	The requested operation is not allowed because access is denied.
08 (0x08)	Memory parity error	The instrument detects a parity error in memory when attempting to read extended memory.

10 (0x0A)	Gateway path unavailable	The gateway is overloaded or not correctly configured.
11 (0x0B)	Gateway target device failed to respond	The target device is not present on the network or failed to respond.

When an exception occurs, the highest bit of the function code is set to 1 and returned.

Example: If the request function code is 0x03, the exception response function code is 0x83.

Function code in exception response	Exception code
0x83	<exception code>

Register List

MODBUS Address (decimal)	0x0 1	0x0 5	0x0 6	0x0 7	Description	Access	Data type	Data length in byte	Number of register	Data	Example or description
80	X				Identification	R	char	100	80	ASCII	
82	X				Nominal Voltage	R	float	4	2	IEEE 754	
84	X				Nominal Current	R	float	4	2	IEEE 754	
86	X				Nominal Power	R	float	4	2	IEEE 754	
800	X		X		Lock Mode	R/W	uint(16)	2	1		0 Lock Panel, Allow Output OFF 1 Lock Panel, Allow Output ON/OFF
801	X		X		Buzzer ON/OFF control	R/W	uint(16)	2	1		Bit0: Alarm Buzzer 0 = OFF, 1 = ON Bit1: Keyboard Buzzer 0 = OFF, 1 = ON
803	X		X		Master/Slave	R/W	uint(16)	2	1		
808	X		X		Output	R/W	uint(16)	2	1		1 = output
811	X		X		Key-lock	R/W	uint(16)	2	1		0 Key/lock 1 Key/lock
813	X		X		LCD backlight off after 60s	R/W	uint(16)	2	1		0 = OFF, 1 = ON
900	X		X		Bleeder circuit control	R/W	uint(16)	2	1		0 = OFF, 1 = ON, 2 = AUTO
901	X		X		CV Control	R/W	uint(16)	2	1		0 = Local control 1 = Analog Program
902	X		X		CC Control	R/W	uint(16)	2	1		0 = Local control 1 = Analog Program
903	X		X		External Output Logic	R/W	uint(16)	2	1		0 = Low is On 1 = High is On 2 = Disable
904	X			X	Internal Resistance Setting	R/W	float	4	2	IEEE 754	
907	X		X		CP Control	R/W	uint(16)	2	1		0 = Local control 1 = Analog Program
908	X		X		CR Control	R/W	uint(16)	2	1		0 = Local control 1 = Analog Program
2800	X				Status Questionable Condition	R	uint(16)	2	1		
2801	X				Status Operation Condition	R	uint(16)	2	1		
2804	X				Status Second Questionable Condition	R	uint(16)	2	1		
3800	X		X		Voltage Setting (DC)	R/W	uint(16)	2	1		This value is percent value (Note 1)
3801	X		X		Current Setting (DC)	R/W	uint(16)	2	1		This value is percent value (Note 1)
3802	X		X		POWERDCI	R/W	uint(16)	2	1		This value is percent value (Note 1)
3803	X		X		Dc Output	R/W	uint(16)	2	1		0 = OFF, 1 = ON
3900	X		X		Voltage Setting Limit (V Limit)	R/W	uint(16)	2	1		This value is percent value (Note 1)
3901	X		X		Rising voltage slew rate	R/W	float	4	2	IEEE 754	
3903	X		X		Falling voltage slew rate	R/W	float	4	2	IEEE 754	
4000	X		X		Current Setting Limit (I Limit)	R/W	uint(16)	2	1		This value is percent value (Note 1)
4001	X		X		Rising current slew rate	R/W	float	4	2	IEEE 754	
4003	X		X		Falling current slew rate	R/W	float	4	2	IEEE 754	
4200	X		X	X	Output Setting Limit(P Limit)	R/W	uint(16)	2	1		This value is percent value (Note 1)
4200	X		X	X	Output ON delay time	R/W	uint(32)	4	2		data = 100, time = 15
4202	X		X	X	Output OFF delay time	R/W	uint(32)	4	2		data = 100, time = 15
4204	X		X		V-I mode slew rate select	R/W	uint(16)	2	1		0 = CV high speed priority (CVHS) 1 = CC high speed priority (CCHS) 2 = CV slew rate priority (CVLS) 3 = CC slew rate priority (CCLS)
4208	X		X	X	Power-ON Output	R/W	uint(16)	2	1		0 = Safe Mode (Output OFF at startup) 1 = Force Mode (Output ON at startup) 2 = Auto Mode (Status before last time Power OFF)
4206	X		X	X	Output State When Receiving Trigger	R/W	uint(16)	2	1		0 = OFF, 1 = ON
4207	X		X	X	Protection Clear	R/W	uint(16)	2	1		1 = Protection Clear
4208	X		X	X	OPP	R/W	uint(16)	2	1		This value is percent value (Note 1)
4201	X		X	X	OCF	R/W	uint(16)	2	1		This value is percent value (Note 1)
4202	X		X	X	UVI	R/W	uint(16)	2	1		This value is percent value (Note 1)
4203	X		X	X	Detection Time of OCP (OCP Delay Time)	R/W	uint(32)	4	2		data = 1000, time = 15
4214	X		X	X	Detection Time of OVP (OVP Delay Time)	R/W	uint(32)	4	2		data = 1000, time = 15
4215	X		X	X	OPP	R/W	uint(16)	2	1		This value is percent value (Note 1)
4219	X		X	X	Detection Time of OPP (OPP Delay Time)	R/W	uint(32)	4	2		data = 1000, time = 15
4221	X		X	X	UCL	R/W	uint(16)	2	1		This value is percent value (Note 1)
4234	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4282	X		X	X	UVD Action	R/W	uint(16)	2	1		This value is percent value (Note 1)
4283	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4284	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4285	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4286	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4287	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4288	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4289	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4290	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4291	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4292	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4293	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4294	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4295	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4296	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4297	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4298	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4299	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4300	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4301	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4302	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4303	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4304	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4305	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4306	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4307	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4308	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4309	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4310	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4311	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4312	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4313	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4314	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4315	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4316	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4317	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4318	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4319	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4320	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4321	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4322	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4323	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4324	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4325	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4326	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4327	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4328	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4329	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4330	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4331	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4332	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4333	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4334	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4335	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4336	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4337	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4338	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4339	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4340	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4341	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4342	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4343	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4344	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4345	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4346	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4347	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4348	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4349	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4350	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4351	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4352	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4353	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4354	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4355	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4356	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4357	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4358	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4359	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
4360	X		X	X	UVD	R/W	uint(16)	2	1		This value is percent value (Note 1)
12802	X		X	X	Communication Watchdog	R/W	uint(16)	2	1		0 ~ 99999 (0 is deactivated) 0 = Lock 1 = Remote 2 = Remote Lock 3 = Local Remote
12808	X		X	X	Communicate RLState	R/W	uint(16)	2	1		0 = OFF, 1 = ON
12809	X		X	X	Communication Watchdog State	R/W	uint(16)	2	1		0 = OFF, 1 = ON
13000	X				Front panel USB State	R	uint(16)	2	1		0 = Absent, 1 = Mass Storage
13001	X				Rear panel USB State	R	uint(16)	2	1		0 = Absent, 1 = Connected to the PC
13002	X		X	X	Rear panel USB mode	R/W	uint(16)	2	1		0 = Disable 1 = USB Host 2 = Auto detect speed 3 = Full speed only

Note 1

Real value = Nominal value * per cent value/52428

Register Descriptions

Information Registers

Register 0: Identification
Description: Returns the instrument identification string in ASCII format.

Access: Read only.

Data format:

Item	Value
Data type	char
Data length	100 bytes
Number of registers	50
Encoding	ASCII

PDU example, read identification:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x00 0x00	0x00 0x32

Response PDU:

Function code	Length of data	Data
0x03	0x64	<100 ASCII data bytes>

Register 50: Nominal Voltage
Description: Returns the nominal output voltage rating of the instrument.

Access: Read only.

Data format:

Item	Value
Data type	float
Data length	4 bytes
Number of registers	2
Format	IEEE 754

PDU example, read nominal voltage:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x00 0x32	0x00 0x02

Response PDU:

Function code	Length of data	Data
0x03	0x04	<IEEE 754 nominal voltage>

Register 52: Description: Returns the nominal output current
Nominal Current rating of the instrument.
Access: Read only.

Data format:

Item	Value
Data type	float
Data length	4 bytes
Number of registers	2
Format	IEEE 754

PDU example, read nominal current:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x00 0x34	0x00 0x02

Response PDU:

Function code	Length of data	Data
0x03	0x04	<IEEE 754 nominal current>

Register 54: Description: Returns the nominal output power
Nominal Power rating of the instrument.
Access: Read only.

Data format:

Item	Value
Data type	float
Data length	4 bytes
Number of registers	2
Format	IEEE 754

PDU example, read nominal power:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x00 0x36	0x00 0x02

Response PDU:

Function code	Length of data	Data
0x03	0x04	<IEEE 754 nominal power>

System Registers

Register 800: Lock Mode Description: Sets or queries the front panel lock mode behavior.

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Values:

- 0: Lock panel, allow output OFF.
- 1: Lock panel, allow output ON/OFF.

PDU example, read lock mode:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x03 0x20	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	0x00 0x00

PDU example, set lock mode to allow output ON/OFF:

Request PDU:

Function code	Starting registers	Data
0x06	0x03 0x20	0x00 0x01

Response PDU:

Function code	Starting registers	Data
0x06	0x03 0x20	0x00 0x01

Register 801: Description: Sets or queries the buzzer enable state. This register provides separate bits for the Buzzer ON/OFF alarm buzzer and keyboard buzzer. Control

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Bit definitions:

- Bit 0: Alarm buzzer. 0 = OFF, 1 = ON.
- Bit 1: Keyboard buzzer. 0 = OFF, 1 = ON.

PDU example, read buzzer control:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x03 0x21	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	0x00 0x03

PDU example, enable both alarm buzzer and keyboard buzzer:

Request PDU:

Function code	Starting registers	Data
0x06	0x03 0x21	0x00 0x03

Response PDU:

Function code	Starting registers	Data
0x06	0x03 0x21	0x00 0x03

Register 803: Description: Sets or queries the unit operation Master/Slave mode. This register selects whether the PHU operates as a single unit, a master unit, or a slave unit.

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Values:

- 0: Single.
- 1: Master.
- 2: Slave.

PDU example, read master/slave mode:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x03 0x23	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	0x00 0x00

PDU example, set mode to Single:

Request PDU:

Function code	Starting registers	Data
0x06	0x03 0x23	0x00 0x00

Response PDU:

Function code	Starting registers	Data
0x06	0x03 0x23	0x00 0x00

Register 808:
Reboot

Description: Reboots the instrument when this register is written with 1.

Access: Write only.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Values:

- 1: Reboot.

PDU example, reboot the instrument:

Request PDU:

Function code	Starting registers	Data
0x06	0x03 0x28	0x00 0x01

Response PDU:

Function code	Starting registers	Data
0x06	0x03 0x28	0x00 0x01

Register 811:

Key Lock

Description: Enables or disables the front panel key lock.

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Values:

- 0: Key unlock.

- 1: Key lock.

PDU example, read key lock:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x03 0x2B	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	0x00 0x00

PDU example, lock front panel keys:

Request PDU:

Function code	Starting registers	Data
0x06	0x03 0x2B	0x00 0x01

Response PDU:

Function code	Starting registers	Data
0x06	0x03 0x2B	0x00 0x01

Register 812: Description: Enables or disables the automatic LCD backlight-off function after 60 seconds.
 LCD Backlight Off After 60s Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Values:

- 0: OFF.

- 1: ON.

PDU example, read LCD backlight setting:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x03 0x2C	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	0x00 0x01

PDU example, enable LCD backlight off after 60 seconds:

Request PDU:

Function code	Starting registers	Data
0x06	0x03 0x2C	0x00 0x01

Response PDU:

Function code	Starting registers	Data
0x06	0x03 0x2C	0x00 0x01

Register 900: Description: Sets or queries the bleeder resistor operating mode.
 Bleeder Circuit Control Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes

Number of registers	1
---------------------	---

Values:

- 0: OFF.
- 1: ON.
- 2: AUTO.

PDU example, read bleeder setting:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x03 0x84	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	0x00 0x02

PDU example, set bleeder to AUTO:

Request PDU:

Function code	Starting registers	Data
0x06	0x03 0x84	0x00 0x02

Response PDU:

Function code	Starting registers	Data
0x06	0x03 0x84	0x00 0x02

Register 901:

CV Control

Description: Sets or queries the constant-voltage control mode.

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Values from the Modbus register list:

- 0: Local control.
- 1: Analog program.

PDU example, read CV control:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x03 0x85	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	0x00 0x00

PDU example, set CV control to analog program:

Request PDU:

Function code	Starting registers	Data
0x06	0x03 0x85	0x00 0x01

Response PDU:

Function code	Starting registers	Data
0x06	0x03 0x85	0x00 0x01

Register 902:

CC Control

Description: Sets or queries the constant-current control mode.

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Values from the Modbus register list:

- 0: Local control.

- 1: Analog program.

PDU example, read CC control:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x03 0x86	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	0x00 0x00

PDU example, set CC control to analog program:

Request PDU:

Function code	Starting registers	Data
0x06	0x03 0x86	0x00 0x01

Response PDU:

Function code	Starting registers	Data
0x06	0x03 0x86	0x00 0x01

Register 903:
External Output
Logic

Description: Sets or queries the external output logic mode.

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Values:

- 0: Low is ON.
- 1: High is ON.
- 2: Disable.

PDU example, read external output logic:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x03 0x87	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	0x00 0x00

PDU example, set external output logic to high is ON:

Request PDU:

Function code	Starting registers	Data
0x06	0x03 0x87	0x00 0x01

Response PDU:

Function code	Starting registers	Data
0x06	0x03 0x87	0x00 0x01

Register 904:
Internal
Resistance
Setting

Description: Sets or queries the internal resistance value in ohms.

Access: Read/write.

Data format:

Item	Value
Data type	float
Data length	4 bytes
Number of registers	2
Format	IEEE 754

PDU example, read internal resistance:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x03 0x88	0x00 0x02

Response PDU:

Function code	Length of data	Data
0x03	0x04	<IEEE 754 resistance>

PDU example, set internal resistance to “1.0 ohm”:

Request PDU:

Function code	Starting registers	Number of register	Length of data	Data
0x10	0x03 0x88	0x00 0x02	0x04	0x3F 0x80 0x00 0x00

Response PDU:

Function code	Starting registers	Number of register
0x10	0x03 0x88	0x00 0x02

Register 907:
CP Control

Description: Sets or queries the constant-power control mode.

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Values:

- 0: Local control.
- 1: Analog program.

PDU example, read CP control:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x03 0x8B	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	0x00 0x00

PDU example, set CP control to analog program:

Request PDU:

Function code	Starting registers	Data
0x06	0x03 0x8B	0x00 0x01

Response PDU:

Function code	Starting registers	Data
0x06	0x03 0x8B	0x00 0x01

Register 908:

CR Control

Description: Sets or queries the constant-resistance control mode.

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Values:

- 0: Local control.
- 1: Analog program.

PDU example, read CR control:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x03 0x8C	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	0x00 0x00

PDU example, set CR control to analog program:

Request PDU:

Function code	Starting registers	Data
0x06	0x03 0x8C	0x00 0x01

Response PDU:

Function code	Starting registers	Data
0x06	0x03 0x8C	0x00 0x01

Status Registers

Register 2800:
Status
Questionable
Condition

Description: Returns the Questionable Status Condition register. This register indicates protection trips, detection events, and other abnormal conditions. Refer to Status Bit Reference for the bit definitions.

Access: Read only.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

PDU example, read questionable status condition:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x0A 0xF0	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	<status Hi> <status Lo>

Register 2801:
Status Operation
Condition

Description: Returns the Operation Status Condition register. This register indicates operating states such as output, remote/local, CV, CP, CC, and delay states. Refer to Status Bit Reference for the bit definitions.

Access: Read only.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

PDU example, read operation status condition:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x0A 0xF1	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	<status Hi> <status Lo>

Register 2804:
Status Second
Questionable
Condition

Description: Returns the Second Questionable Status Condition register. This register indicates power-unit and fan-failure related conditions. Refer to Status Bit Reference for the bit definitions.

Access: Read only.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

PDU example, read second questionable status condition:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x0A 0xF4	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	<status Hi> <status Lo>

DC Source Registers

Register 3800:
Voltage Setting
(DC)

Description: Sets or queries the DC output voltage setting.

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Scaling: This register uses percent value format.

Real voltage = Nominal voltage * register value / 52428

PDU example, read voltage setting:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x0E 0xD8	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	<value Hi> <value Lo>

PDU example, set voltage setting to nominal value, register value "52428" ("0xCCCC"):

Request PDU:

Function code	Starting registers	Data
0x06	0x0E 0xD8	0xCC 0xCC

Response PDU:

Function code	Starting registers	Data
0x06	0x0E 0xD8	0xCC 0xCC

Register 3801:
Current Setting
(DC)

Description: Sets or queries the DC output current setting.

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Scaling: This register uses percent value format.

Real current = Nominal current * register value / 52428

PDU example, read current setting:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x0E 0xD9	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	<value Hi> <value Lo>

PDU example, set current setting to nominal value, register value "52428" ("0xCCCC"):

Request PDU:

Function code	Starting registers	Data
0x06	0x0E 0xD9	0xCC 0xCC

Response PDU:

Function code	Starting registers	Data
0x06	0x0E 0xD9	0xCC 0xCC

Register 3802:
Power Setting
(DC)

Description: Sets or queries the DC output power setting.

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Scaling: This register uses percent value format.

Real power = Nominal power * register value / 52428

PDU example, read power setting:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x0E 0xDA	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	<value Hi> <value Lo>

PDU example, set power setting to nominal value, register value "52428" ("0xCCCC"):

Request PDU:

Function code	Starting registers	Data
0x06	0x0E 0xDA	0xCC 0xCC

Response PDU:

Function code	Starting registers	Data
0x06	0x0E 0xDA	0xCC 0xCC

Register 3803:
DC Output

Description: Turns the DC output on or off, or queries the output state setting.

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Values:

- 0: OFF.

- 1: ON.

PDU example, read DC output state:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x0E 0xDB	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	0x00 0x00

PDU example, turn DC output ON:

Request PDU:

Function code	Starting registers	Data
0x06	0x0E 0xDB	0x00 0x01

Response PDU:

Function code	Starting registers	Data
0x06	0x0E 0xDB	0x00 0x01

Register 3900:
Voltage Setting
Limit (V Limit)

Description: Sets or queries the voltage setting limit.

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Scaling: This register uses percent value format.

PDU example, read voltage setting limit:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x0F 0x3C	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	<value Hi> <value Lo>

PDU example, set voltage setting limit to nominal value, register value “52428” (“0xCCCC”):

Request PDU:

Function code	Starting registers	Data
0x06	0x0F 0x3C	0xCC 0xCC

Response PDU:

Function code	Starting registers	Data
0x06	0x0F 0x3C	0xCC 0xCC

Register 3901:
Rising Voltage
Slew Rate

Description: Sets or queries the rising voltage slew rate.

Access: Read/write.

Data format:

Item	Value
Data type	float
Data length	4 bytes
Number of registers	2
Format	IEEE 754

PDU example, read rising voltage slew rate:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x0F 0x3D	0x00 0x02

Response PDU:

Function code	Length of data	Data
0x03	0x04	<IEEE 754 V/s>

PDU example, set rising voltage slew rate to “1.0 V/s”:

Request PDU:

Function code	Starting registers	Number of register	Length of data	Data
0x10	0x0F 0x3D	0x00 0x02	0x04	0x3F 0x80 0x00 0x00

Response PDU:

Function code	Starting registers	Number of register
0x10	0x0F 0x3D	0x00 0x02

Register 3903:
Falling Voltage
Slew Rate

Description: Sets or queries the falling voltage slew rate.

Access: Read/write.

Data format:

Item	Value
Data type	float
Data length	4 bytes
Number of registers	2
Format	IEEE 754

PDU example, read falling voltage slew rate:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x0F 0x3F	0x00 0x02

Response PDU:

Function code	Length of data	Data
0x03	0x04	<IEEE 754 V/s>

PDU example, set falling voltage slew rate to "1.0 V/s":

Request PDU:

Function code	Starting registers	Number of register	Length of data	Data
0x10	0x0F 0x3F	0x00 0x02	0x04	0x3F 0x80 0x00 0x00

Response PDU:

Function code	Starting registers	Number of register
0x10	0x0F 0x3F	0x00 0x02

Register 4000:
Current Setting
Limit (I Limit)

Description: Sets or queries the current setting limit.

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Scaling: This register uses percent value format.

PDU example, read current setting limit:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x0F 0xA0	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	<value Hi> <value Lo>

PDU example, set current setting limit to nominal value, register value “52428” (“0xCCCC”):

Request PDU:

Function code	Starting registers	Data
0x06	0x0F 0xA0	0xCC 0xCC

Response PDU:

Function code	Starting registers	Data
0x06	0x0F 0xA0	0xCC 0xCC

Register 4001:
Rising Current
Slew Rate

Description: Sets or queries the rising current slew rate.

Access: Read/write.

Data format:

Item	Value
Data type	float
Data length	4 bytes
Number of registers	2
Format	IEEE 754

PDU example, read rising current slew rate:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x0F 0xA1	0x00 0x02

Response PDU:

Function code	Length of data	Data
0x03	0x04	<IEEE 754 A/s>

PDU example, set rising current slew rate to “1.0 A/s”:

Request PDU:

Function code	Starting registers	Number of register	Length of data	Data
0x10	0x0F 0xA1	0x00 0x02	0x04	0x3F 0x80 0x00 0x00

Response PDU:

Function code	Starting registers	Number of register
0x10	0x0F 0xA1	0x00 0x02

Register 4003:
Falling Current
Slew Rate

Description: Sets or queries the falling current slew rate.

Access: Read/write.

Data format:

Item	Value
Data type	float
Data length	4 bytes
Number of registers	2
Format	IEEE 754

PDU example, read falling current slew rate:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x0F 0xA3	0x00 0x02

Response PDU:

Function code	Length of data	Data
0x03	0x04	<IEEE 754 A/s>

PDU example, set falling current slew rate to “1.0 A/s”:

Request PDU:

Function code	Starting registers	Number of register	Length of data	Data
0x10	0x0F 0xA3	0x00 0x02	0x04	0x3F 0x80 0x00 0x00

Response PDU:

Function code	Starting registers	Number of register
0x10	0x0F 0xA3	0x00 0x02

Register 4100: Description: Sets or queries the power setting limit.
Power Setting
Limit (P Limit) Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Scaling: This register uses percent value format.

PDU example, read power setting limit:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x10 0x04	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	<value Hi> <value Lo>

PDU example, set power setting limit to nominal value, register value "52428" ("0xCCCC"):

Request PDU:

Function code	Starting registers	Data
0x06	0x10 0x04	0xCC 0xCC

Response PDU:

Function code	Starting registers	Data
0x06	0x10 0x04	0xCC 0xCC

Output Registers

Register 4200: Description: Sets or queries the delay time in seconds before the output turns on.
Output ON Delay Time Access: Read/write.

Data format:

Item	Value
Data type	uint32
Data length	4 bytes

Number of registers	2
---------------------	---

Scaling: data = 100 means 1 s.

PDU example, read output ON delay time:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x10 0x68	0x00 0x02

Response PDU:

Function code	Length of data	Data
0x03	0x04	<uint32 delay data>

PDU example, set output ON delay time to “1 s”, data “100” (“0x00000064”):

Request PDU:

Function code	Starting registers	Number of register	Length of data	Data
0x10	0x10 0x68	0x00 0x02	0x04	0x00 0x00 0x00 0x64

Response PDU:

Function code	Starting registers	Number of register
0x10	0x10 0x68	0x00 0x02

Register 4202:
Output OFF
Delay Time

Description: Sets or queries the delay time in seconds before the output turns off.

Access: Read/write.

Data format:

Item	Value
Data type	uint32
Data length	4 bytes
Number of registers	2

Scaling: data = 100 means 1 s.

PDU example, read output OFF delay time:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x10 0x6A	0x00 0x02

Response PDU:

Function code	Length of data	Data
0x03	0x04	<uint32 delay data>

PDU example, set output OFF delay time to “1 s”, data “100” (“0x00000064”):

Request PDU:

Function code	Starting registers	Number of register	Length of data	Data
0x10	0x10 0x6A	0x00 0x02	0x04	0x00 0x00 0x00 0x64

Response PDU:

Function code	Starting registers	Number of register
0x10	0x10 0x6A	0x00 0x02

Register 4204:

V-I Mode Slew
Rate Select

Description: Sets or queries the V-I mode used for output response and slew-rate behavior.

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Values:

- 0: CV high speed priority (CVHS).
- 1: CC high speed priority (CCHS).
- 2: CV slew rate priority (CVLS).
- 3: CC slew rate priority (CCLS).

PDU example, read V-I mode:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x10 0x6C	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	0x00 0x00

PDU example, set mode to CV slew rate priority:

Request PDU:

Function code	Starting registers	Data
0x06	0x10 0x6C	0x00 0x02

Response PDU:

Function code	Starting registers	Data
0x06	0x10 0x6C	0x00 0x02

Register 4205:
Power-ON
Output

Description: Sets or queries the output state behavior at power-up.

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Values:

- 0: Safe Mode, output OFF at startup.
- 1: Force Mode, output ON at startup.
- 2: Auto Mode, restore status before last power off.

PDU example, read power-on output mode:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x10 0x6D	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	0x00 0x00

PDU example, set power-on output mode to Safe Mode:

Request PDU:

Function code	Starting registers	Data
0x06	0x10 0x6D	0x00 0x00

Response PDU:

Function code	Starting registers	Data
0x06	0x10 0x6D	0x00 0x00

Register 4206:
Output State
When Receiving
Trigger

Description: Sets or queries the output state that is applied when an output trigger is received.

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Values:

- 0: OFF.

- 1: ON.

PDU example, read triggered output state:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x10 0x6E	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	0x00 0x01

PDU example, set triggered output state to ON:

Request PDU:

Function code	Starting registers	Data
0x06	0x10 0x6E	0x00 0x01

Response PDU:

Function code	Starting registers	Data
0x06	0x10 0x6E	0x00 0x01

Register 4207: Description: Clears the protection state when this
Protection Clear register is written with 1.

Access: Write only.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Values:

- 1: Protection clear.

PDU example, clear protection:

Request PDU:

Function code	Starting registers	Data
0x06	0x10 0x6F	0x00 0x01

Response PDU:

Function code	Starting registers	Data
0x06	0x10 0x6F	0x00 0x01

Protection Registers

Register 4300: Description: Sets or queries the over-voltage
OVP protection level.

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Scaling: This register uses percent value format.

PDU example, read OVP level:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x10 0xCC	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	<value Hi> <value Lo>

PDU example, set OVP to nominal value, register value "52428" ("0xCCCC"):

Request PDU:

Function code	Starting registers	Data
0x06	0x10 0xCC	0xCC 0xCC

Response PDU:

Function code	Starting registers	Data
0x06	0x10 0xCC	0xCC 0xCC

Register 4301:
OCP

Description: Sets or queries the over-current protection level.

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Scaling: This register uses percent value format.

PDU example, read OCP level:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x10 0xCD	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	<value Hi> <value Lo>

PDU example, set OCP to nominal value, register value "52428" ("0xCCCC"):

Request PDU:

Function code	Starting registers	Data
0x06	0x10 0xCD	0xCC 0xCC

Response PDU:

Function code	Starting registers	Data
0x06	0x10 0xCD	0xCC 0xCC

Register 4302: Description: Sets or queries the under-voltage limit level.

UVL

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Scaling: This register uses percent value format.

PDU example, read UVL:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x10 0xCE	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	<value Hi> <value Lo>

PDU example, set UVL to nominal value, register value "52428" ("0xCCCC"):

Request PDU:

Function code	Starting registers	Data
0x06	0x10 0xCE	0xCC 0xCC

Response PDU:

Function code	Starting registers	Data
0x06	0x10 0xCE	0xCC 0xCC

Register 4303: Description: Sets or queries the OCP detection delay time.
 Detection Time of OCP Access: Read/write.

Data format:

Item	Value
Data type	uint32
Data length	4 bytes
Number of registers	2

Scaling: data = 1000 means 1 s.

PDU example, read OCP detection time:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x10 0xCF	0x00 0x02

Response PDU:

Function code	Length of data	Data
0x03	0x04	<uint32 delay data>

PDU example, set OCP detection time to “1 s”,
 data “1000” (“0x000003E8”):

Request PDU:

Function code	Starting registers	Number of register	Length of data	Data
0x10	0x10 0xCF	0x00 0x02	0x04	0x00 0x00 0x03 0xE8

Response PDU:

Function code	Starting registers	Number of register
0x10	0x10 0xCF	0x00 0x02

Register 4314: Description: Sets or queries the OVP detection delay time.
Detection Time of OVP Access: Read/write.

Data format:

Item	Value
Data type	uint32
Data length	4 bytes
Number of registers	2

Scaling: data = 1000 means 1 s.

PDU example, read OVP detection time:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x10 0xDA	0x00 0x02

Response PDU:

Function code	Length of data	Data
0x03	0x04	<uint32 delay data>

PDU example, set OVP detection time to “1 s”, data “1000” (“0x000003E8”):

Request PDU:

Function code	Starting registers	Number of register	Length of data	Data
0x10	0x10 0xDA	0x00 0x02	0x04	0x00 0x00 0x03 0xE8

Response PDU:

Function code	Starting registers	Number of register
0x10	0x10 0xDA	0x00 0x02

Register 4316: Description: Sets or queries the over-power protection level.
OPP

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Scaling: This register uses percent value format.

PDU example, read OPP:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x10 0xDC	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	<value Hi> <value Lo>

PDU example, set OPP to nominal value, register value "52428" ("0xCCCC"):

Request PDU:

Function code	Starting registers	Data
0x06	0x10 0xDC	0xCC 0xCC

Response PDU:

Function code	Starting registers	Data
0x06	0x10 0xDC	0xCC 0xCC

Register 4319: Description: Sets or queries the OPP detection delay time.
Detection Time of OPP Access: Read/write.

Data format:

Item	Value
Data type	uint32
Data length	4 bytes
Number of registers	2

Scaling: data = 1000 means 1 s.

PDU example, read OPP detection time:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x10 0xDF	0x00 0x02

Response PDU:

Function code	Length of data	Data
0x03	0x04	<uint32 delay data>

PDU example, set OPP detection time to "1 s", data "1000" ("0x000003E8"):

Request PDU:

Function code	Starting registers	Number of register	Length of data	Data
0x10	0x10 0xDF	0x00 0x02	0x04	0x00 0x00 0x03 0xE8

Response PDU:

Function code	Starting registers	Number of register
0x10	0x10 0xDF	0x00 0x02

Register 4321: Description: Sets or queries the under-current limit level.

UCL

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Scaling: This register uses percent value format.

PDU example, read UCL:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x10 0xE1	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	<value Hi> <value Lo>

PDU example, set UCL to nominal value, register value "52428" ("0xCCCC"):

Request PDU:

Function code	Starting registers	Data
0x06	0x10 0xE1	0xCC 0xCC

Response PDU:

Function code	Starting registers	Data
0x06	0x10 0xE1	0xCC 0xCC

Register 4324: Description: Sets or queries the under-voltage detection threshold.

UVD

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Scaling: This register uses percent value format.

PDU example, read UVD:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x10 0xE4	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	<value Hi> <value Lo>

PDU example, set UVD to nominal value, register value "52428" ("0xCCCC"):

Request PDU:

Function code	Starting registers	Data
0x06	0x10 0xE4	0xCC 0xCC

Response PDU:

Function code	Starting registers	Data
0x06	0x10 0xE4	0xCC 0xCC

Register 4327: Description: Writes or reads the action behavior used when UVD is detected.

UVD Action

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Action value:

Value	Meaning
0	NONE
1	SIGNAL
2	ALARM

PDU example, read UVD action:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x10 0xE7	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	<action Hi> <action Lo>

PDU example, write UVD action value "1":

Request PDU:

Function code	Starting registers	Data
0x06	0x10 0xE7	0x00 0x01

Response PDU:

Function code	Starting registers	Data
0x06	0x10 0xE7	0x00 0x01

Register 4328:
OVD

Description: Sets or queries the over-voltage detection threshold.

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Scaling: This register uses percent value format.

PDU example, read OVD:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x10 0xE8	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	<value Hi><value Lo>

PDU example, set OVD to nominal value, register value "52428" ("0xCCCC"):

Request PDU:

Function code	Starting registers	Data
0x06	0x10 0xE8	0xCC 0xCC

Response PDU:

Function code	Starting registers	Data
0x06	0x10 0xE8	0xCC 0xCC

Register 4331:
OVD Action

Description: Writes or reads the action behavior used when OVD is detected.

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Action value:

Value	Meaning
0	NONE
1	SIGNAL
2	ALARM

PDU example, read OVD action:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x10 0xEB	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	<action Hi> <action Lo>

PDU example, write OVD action value “1”:

Request PDU:

Function code	Starting registers	Data
0x06	0x10 0xEB	0x00 0x01

Response PDU:

Function code	Starting registers	Data
0x06	0x10 0xEB	0x00 0x01

Register 4332: Description: Sets or queries the under-current detection threshold.
UCD

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Scaling: This register uses percent value format.

PDU example, read UCD:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x10 0xEC	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	<value Hi><value Lo>

PDU example, set UCD to nominal value, register value “52428” (“0xCCCC”):

Request PDU:

Function code	Starting registers	Data
0x06	0x10 0xEC	0xCC 0xCC

Response PDU:

Function code	Starting registers	Data
0x06	0x10 0xEC	0xCC 0xCC

Register 4335: Description: Writes or reads the action behavior used when UCD is detected.

UCD Action

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Action value:

Value	Meaning
0	NONE
1	SIGNAL
2	ALARM

PDU example, read UCD action:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x10 0xEF	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	<action Hi> <action Lo>

PDU example, write UCD action value "1":

Request PDU:

Function code	Starting registers	Data
0x06	0x10 0xEF	0x00 0x01

Response PDU:

Function code	Starting registers	Data
0x06	0x10 0xEF	0x00 0x01

Register 4336: Description: Sets or queries the over-current detection threshold.

OCD

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes

Number of registers	1
---------------------	---

Scaling: This register uses percent value format.

PDU example, read OCD:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x10 0xF0	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	<value Hi><value Lo>

PDU example, set OCD to nominal value, register value "52428" ("0xCCCC"):

Request PDU:

Function code	Starting registers	Data
0x06	0x10 0xF0	0xCC 0xCC

Response PDU:

Function code	Starting registers	Data
0x06	0x10 0xF0	0xCC 0xCC

Register 4339: Description: Writes or reads the action behavior used when OCD is detected.

OCD Action

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Action value:

Value	Meaning
0	NONE
1	SIGNAL
2	ALARM

PDU example, read OCD action:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x10 0xF3	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	<action Hi> <action Lo>

PDU example, write OCD action value "1":

Request PDU:

Function code	Starting registers	Data
0x06	0x10 0xF3	0x00 0x01

Response PDU:

Function code	Starting registers	Data
0x06	0x10 0xF3	0x00 0x01

Register 4340:
OPD

Description: Sets or queries the over-power detection threshold.

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Scaling: This register uses percent value format.

PDU example, read OPD:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x10 0xF4	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	<value Hi> <value Lo>

PDU example, set OPD to nominal value, register value "52428" ("0xCCCC"):

Request PDU:

Function code	Starting registers	Data
0x06	0x10 0xF4	0xCC 0xCC

Response PDU:

Function code	Starting registers	Data
0x06	0x10 0xF4	0xCC 0xCC

Register 4343: Description: Writes or reads the action behavior used when OPD is detected.

OPD Action

Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Action value:

Value	Meaning
0	NONE
1	SIGNAL
2	ALARM

PDU example, read OPD action:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x10 0xF7	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	<action Hi> <action Lo>

PDU example, write OPD action value "1":

Request PDU:

Function code	Starting registers	Data
0x06	0x10 0xF7	0x00 0x01

Response PDU:

Function code	Starting registers	Data
0x06	0x10 0xF7	0x00 0x01

Measurement Registers

Register 4400: Description: Takes a measurement and returns the output voltage in percent value format.
Measure Voltage Access: Read only.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Scaling: This register uses percent value format.

PDU example, read measured voltage:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x11 0x30	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	<value Hi> <value Lo>

Register 4401: Description: Takes a measurement and returns the output current in percent value format.
Measure Current Access: Read only.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Scaling: This register uses percent value format.

PDU example, read measured current:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x11 0x31	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	<value Hi> <value Lo>

Register 4402: Description: Takes a measurement and returns the output power in percent value format.

Measure Power

Access: Read only.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Scaling: This register uses percent value format.

PDU example, read measured power:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x11 0x32	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	<value Hi> <value Lo>

Register 4403: Description: Sets or queries the measurement averaging level.

Measurement

Average Setting Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Values:

- 0: Low.
- 1: Middle.
- 2: High.

PDU example, read measurement average setting:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x11 0x33	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	0x00 0x01

PDU example, set average setting to Middle:

Request PDU:

Function code	Starting registers	Data
0x06	0x11 0x33	0x00 0x01

Response PDU:

Function code	Starting registers	Data
0x06	0x11 0x33	0x00 0x01

Register 4404:
Measure
Voltage (High
Resolution)

Description: Takes a measurement and returns the output voltage as a high-resolution floating-point value.

Access: Read only.

Data format:

Item	Value
Data type	float
Data length	4 bytes
Number of registers	2
Format	IEEE 754

PDU example, read high-resolution measured voltage:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x11 0x34	0x00 0x02

Response PDU:

Function code	Length of data	Data
0x03	0x04	<IEEE 754 voltage>

Register 4406: Description: Takes a measurement and returns the output current as a high-resolution floating-point value.
Measure
Current (High
Resolution) Access: Read only.

Data format:

Item	Value
Data type	float
Data length	4 bytes
Number of registers	2
Format	IEEE 754

PDU example, read high-resolution measured current:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x11 0x36	0x00 0x02

Response PDU:

Function code	Length of data	Data
0x03	0x04	<IEEE 754 current>

Register 4408: Description: Takes a measurement and returns the output power as a high-resolution floating-point value.
Measure Power
(High
Resolution) Access: Read only.

Data format:

Item	Value
Data type	float
Data length	4 bytes
Number of registers	2
Format	IEEE 754

PDU example, read high-resolution measured power:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x11 0x38	0x00 0x02

Response PDU:

Function code	Length of data	Data
0x03	0x04	<IEEE 754 power>

Register 4600: Description: Sets or queries the resistance setting limit.

Resistance Setting Limit (R Limit) Access: Read/write.

Data format:

Item	Value
Data type	float
Data length	4 bytes
Number of registers	2
Format	IEEE 754

PDU example, read resistance setting limit:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x11 0xF8	0x00 0x02

Response PDU:

Function code	Length of data	Data
0x03	0x04	<IEEE 754 resistance>

PDU example, set resistance setting limit to “1.0 ohm”:

Request PDU:

Function code	Starting registers	Number of register	Length of data	Data
0x10	0x11 0xF8	0x00 0x02	0x04	0x3F 0x80 0x00 0x00

Response PDU:

Function code	Starting registers	Number of register
0x10	0x11 0xF8	0x00 0x02

Communication Registers

Register 12802: Description: Sets or queries the communication watchdog time.
Communication Watchdog Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Values: 0 to 65535; 0 disables the watchdog.

PDU example, read communication watchdog:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x32 0x02	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	<value Hi> <value Lo>

PDU example, set communication watchdog to "100":

Request PDU:

Function code	Starting registers	Data
0x06	0x32 0x02	0x00 0x64

Response PDU:

Function code	Starting registers	Data
0x06	0x32 0x02	0x00 0x64

Register 12805: Description: Sets or queries the instrument remote/local control state.
Communicate RLState Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Values:

- 0: Local.
- 1: Remote.
- 2: Remote Lock.
- 3: Local Remote.

PDU example, read communicate RLState:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x32 0x05	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	0x00 0x00

PDU example, set control state to Remote:

Request PDU:

Function code	Starting registers	Data
0x06	0x32 0x05	0x00 0x01

Response PDU:

Function code	Starting registers	Data
0x06	0x32 0x05	0x00 0x01

Register 12806: Description: Enables, disables, or queries the communication watchdog function.

Watchdog State Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Values:

- 0: OFF.
- 1: ON.

PDU example, read communication watchdog state:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x32 0x06	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	0x00 0x00

PDU example, enable communication watchdog:

Request PDU:

Function code	Starting registers	Data
0x06	0x32 0x06	0x00 0x01

Response PDU:

Function code	Starting registers	Data
0x06	0x32 0x06	0x00 0x01

USB Registers

Register 13000: Description: Returns the front panel USB-A port Front Panel USB state.

State

Access: Read only.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Values:

- 0: Absent.
- 1: Mass Storage.

PDU example, read front panel USB state:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x32 0xC8	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	0x00 0x00

Register 13001: Description: Returns the rear panel USB-B port state.
Rear Panel USB State Access: Read only.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Values from the Modbus register list:

- 0: Absent.
- 1: Connected to the PC.

PDU example, read rear panel USB state:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x32 0xC9	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	0x00 0x01

Register 13002: Description: Sets or queries the rear panel USB-B port mode.
Rear Panel USB Mode Access: Read/write.

Data format:

Item	Value
Data type	uint16
Data length	2 bytes
Number of registers	1

Values:

- 0: Disable.
- 1: USB Host.
- 2: Auto detect speed.
- 3: Full speed only.

PDU example, read rear panel USB mode:

Request PDU:

Function code	Starting registers	Number of register
0x03	0x32 0xCA	0x00 0x01

Response PDU:

Function code	Length of data	Data
0x03	0x02	0x00 0x02

PDU example, set rear panel USB mode to USB Host:

Request PDU:

Function code	Starting registers	Data
0x06	0x32 0xCA	0x00 0x01

Response PDU:

Function code	Starting registers	Data
0x06	0x32 0xCA	0x00 0x01

Status Bit Reference

Questionable Status Condition

Register 2800 corresponds to the Questionable Status Condition register.

Bit	Weight	Name	Meaning
0	1	OVP	Over-voltage protection has been tripped.
1	2	OCP	Over-current protection has been tripped.
2	4	OPP	Over-power protection has been tripped.
3	8	POW	AC power switch is off.
4	16	OTP	Over-temperature protection has been tripped.
5	32	UVD	Under-voltage detect has been tripped.
7	128	WDOG	Communication watchdog alarm.
8	256	OVD	Over-voltage detect has been tripped.
9	512	OCD	Over-current detect has been tripped.
10	1024	UCD	Under-current detect has been tripped.
11	2048	LLF	Load lead fault.
12	4096	OPD	Over-power detect has been tripped.
13	8192	SLF	Sense lead fault.
14	16384	MSP	Master-slave protection has been tripped.

Operation Status Condition

Register 2801 corresponds to the Operation Status Condition register.

Bit	Weight	Name	Meaning
0	1	CAL	Calibration mode.
1	2	Lock	Lock state.
3	8	Output	Output state.
4	16	RMT	Remote state.
5	32	WTG	Waiting for trigger.
6	64	SS	Screen saver.
7	128	LOC	Local state.
8	256	CV	Constant-voltage mode.
9	512	CP	Constant-power mode.

10	1024	CC	Constant-current mode.
11	2048	OND	Output ON delay active.
12	4096	OFD	Output OFF delay active.
13	8192	FOFF	Force output off.
14	16384	PR	Program running.

Second Questionable Status Condition

Register 2804 corresponds to the Second Questionable Status Condition register.

Bit	Weight	Name	Meaning
0	1	PUF1	Power Unit 1 Fail.
1	2	PUF2	Power Unit 2 Fail.
2	4	PUF3	Power Unit 3 Fail.
3	8	PUF4	Power Unit 4 Fail.
4	16	PUF5	Power Unit 5 Fail.
5	32	PUF6	Power Unit 6 Fail.
6	64	FAN1	Fan 1 Fail.
7	128	FAN2	Fan 2 Fail.
8	256	FAN3	Fan 3 Fail.
14	16384	Ext_Alarm	Shutdown from Analog Interface.