Raritan PX2/PX3 Modbus Interface

Contents

Introduction

The PX2 device can act as a Modbus/TCP server. The Modbus service can be enabled in the Network Services section of the Device Settings menu in the web UI.

Supported Modbus Functions

The following Modbus function codes are supported:

- General Commands:
  - Read Device Identification (0x2b)
- Bit Access:
  - Read Coils (0x01)
  - Write Coils (0x05)
  - Write Multiple Coils (0x0f)
- 16-bit Word Access:
  - Read Holding Registers (0x03)
  - Write Single Register (0x06)
  - Write Multiple Registers (0x10)
  - Mask Write Register (0x16)

Feature Set

The following features of the PX2/PX3 are available via Modbus:

- Sensor readings for inlets and overcurrent protectors
- Outlet sensor readings (PX2-4K, PX2-5K, PX3-4K and PX3-5K series)
- Outlet control (PX2-2K, PX2-5K, PX3-2K, and PX3-5K series)
- Transfer switch status and control (PX3TS series)
- Peripheral sensor readings
- Peripheral actuator control

Register Layout

Conventions

- All register or coil addresses are hexadecimal, indicated by a 0x prefix.
- Data types which span multiple 16-bit registers are big-endian, i.e. the lowest register address contains the most significant bits.
- The following data types are supported for holding registers:
  - Word: 16-bit unsigned integer
  - DWord: 32-bit unsigned integer (two registers, big-endian)
  - QWord: 64-bit unsigned integer (four registers, big-endian)
  - Float: IEEE 32-bit floating point value (two registers, big-endian)
  - Bit Mask: 16 individual bits
- The access flags column can have the following values:
  - R: Read-only register
  - W: Write-only register (writing triggers an action, always reads 0)
  - R/W: Read-write register
- Reading a reserved register usually yields zero, but the meaning may change in future versions.
- Reserved bits in bit mask registers should always be written as 0.

Holding Register Map

Start	End	Function	See Section
0x0000	0x0010	Basic parameters, PDU layout	Basic PDU Parameters
...			
0x0800	0x080f	Peripheral sensor 1	Peripheral Sensors
0x0810	0x081f	Peripheral sensor 2	
...			
0x09f0	0x09ff	Peripheral sensor 32	
...			
0x2000	0x20ff	Transfer switch 1	Transfer Switches
0x2100	0x21ff	Transfer switch 2	
...			
0x2f00	0x2fff	Transfer switch 16	
0x3000	0x303f	Inlet 1	Inlets
0x3040	0x306f	Inlet 1 pole 1	Poles

Start	End	Function	See Section
0x3070	0x309f	Inlet 1 pole 2	
0x30a0	0x30cf	Inlet 1 pole 3	
0x30d0	0x30ff	Inlet 1 pole 4	
0x3100	0x31ff	Inlet 2 (incl. poles)	
...			
0x3f00	0x3fff	Inlet 16 (incl. poles)	
0x4000	0x403f	Overcurrent protector 1	Overcurrent Protectors
0x4040	0x406f	OCP 1 pole 1	Poles
0x4070	0x409f	OCP 1 pole 2	
0x40a0	0x40cf	OCP 1 pole 3	
0x40d0	0x40ff	OCP 1 pole 4	
0x4100	0x41ff	OCP 2 (incl. poles)	
...			
0x7f00	0x7fff	OCP 64 (incl. poles)	
0x8000	0x80ff	Outlet 1	Outlets
0x8040	0x806f	Outlet 1 pole 1	Poles
0x8070	0x809f	Outlet 1 pole 2	
0x80a0	0x80cf	Outlet 1 pole 3	
0x80d0	0x80ff	Outlet 1 pole 4	
0x8100	0x81ff	Outlet 2 (incl. poles)	
...			
0xff00	0xffff	Outlet 128 (incl. poles)	

Coil Map

Coil Address	Access	Function
0x0000	R	Overcurrent protector 1 status
0x0001	R	Overcurrent protector 2 status
...		
0x003f	R	Overcurrent protector 64 status
...		
0x0100	R/W	Outlet 1 state
0x0101	R/W	Outlet 2 state
...		
0x017f	R/W	Outlet 128 state

Basic PDU Parameters

Address	Type	Access	Parameter
0x0000	Word	R	Register set version (8 bit major, 8 bit minor)
0x0001	Word	R	Number of inlets
0x0002	Word	R	Number of overcurrent protectors
0x0003	Word	R	Number of outlets
0x0004	Word	R	Number of transfer switches

Peripheral Sensors

- Up to 32 sensors, 16 holding registers each
- Base address (i = 0..31): 0x0800 + i * 0x0010

Offset	Type	Access	Parameter
0x00	Word	R	Sensor type: • 0: unassigned • 1: Temperature in degrees Celsius • 2: Relative humidity in % • 3: Air flow in m/s • 4: Air pressure in Pa • 5: Contact closure (0: off, 1: on) • 6: Vibration in G • 7: Water leak (0: normal, 1: alarm) • 8: Smoke detector (0: normal, 1: alarm) • 9: Ambient light in lux • 10: Dry contact (actuator, 0: off, 1: on) • 11: Magnetic contact (0: off, 1: on) • 12: Passive IR motion detector (0: off, 1: on) • 13: Tamper detector (0: normal, 1: alarm) • 14: Powered dry contact (actuator, 0: off, 1: on) • 15: Absolute humidity in g/mˆ3 • 16: Acceleration in G
0x01	Word	R	State (for discrete sensors)
0x02~0x03	Float	R	Sensor reading (for numerical sensors, see above for unit)
0x04	Word	R/W	Actuator control
0x05~0x0f			Reserved

Transfer Switches

- Up to 16 transfer switches, 256 holding registers each
- Base address (i = 0..15): 0x2000 + i * 0x0100

Offset	Type	Access	Parameter
0x00	Bit Mask	R	Transfer switch capabilities (supported sensors): • Bit 0: Inlet voltage phase difference sensor • Bits 1~15: Reserved
0x01	Word	R	Selected inlet: • 0: No active inlet • 1: Inlet 1 • 2: Inlet 2
0x02	Word	R	Preferred inlet: • 1: Inlet 1 • 2: Inlet 2
0x03	Word	W	Transfer to inlet. If the new inlet is available, it will become both active and preferred. • Bits 0~30: New active inlet (1 or 2) • Bit 31: Force switch even if the phase difference between the inlets is too large
0x04	Bit Mask	R	Fault flags: • Bit 0: Inlet phases out of sync • Bit 1: Overload alarm • Bits 2~15: Reserved
0x05	Bit Mask	R	Inlet 1 fault flags: • Bit 0: +12 V power supply fault • Bit 1: Fuse blown • Bit 2: MOV surge protector fault • Bit 3: Switch open • Bit 4: Switch short • Bits 5~15: Reserved
0x06	Bit Mask	R	Inlet 2 fault flags (see above)
0x07			Reserved

Offset	Type	Access	Parameter
0x08~0x09	Float	R	Inlet voltage phase difference in degrees
0x0a~0x1f			Reserved
0x20	Bit Mask	R/W	Transfer settings: • Bit 0: Enable automatic retransfer • Bit 1: Suppress automatic retransfer on phase sync alarm • Bit 2: Enable manual transfer front panel button • Bits 3~15: Reserved
0x21	Word	R/W	Automatic retransfer wait time in seconds
0x22	Bit Mask	R/W	Inlet 1 enabled voltage thresholds: • Bit 0: Lower critical threshold enabled • Bit 1: Lower warning threshold enabled • Bit 2: Upper warning threshold enabled • Bit 3: Upper critical threshold enabled • Bits 4~15: Reserved
0x23	Word	R/W	Inlet 1 lower critical voltage threshold (0.01 V)
0x24	Word	R/W	Inlet 1 lower warning voltage threshold (0.01 V)
0x25	Word	R/W	Inlet 1 upper warning voltage threshold (0.01 V)
0x26	Word	R/W	Inlet 1 upper critical voltage threshold (0.01 V)
0x27	Word	R/W	Inlet 1 voltage assertion timeout (seconds)
0x28	Word	R/W	Inlet 1 voltage deassertion hysteresis (0.01 V)
0x29	Bit Mask	R/W	Inlet 1 enabled frequency thresholds: • Bit 0: Lower critical threshold enabled • Bit 1: Lower warning threshold enabled • Bit 2: Upper warning threshold enabled • Bit 3: Upper critical threshold enabled • Bits 4~15: Reserved
0x2a	Word	R/W	Inlet 1 lower critical frequency threshold (0.01 Hz)

Offset	Type	Access	Parameter
0x2b	Word	R/W	Inlet 1 lower warning frequency threshold (0.01 Hz)
0x2c	Word	R/W	Inlet 1 upper warning frequency threshold (0.01 Hz)
0x2d	Word	R/W	Inlet 1 upper critical frequency threshold (0.01 Hz)
0x2e	Word	R/W	Inlet 1 frequency assertion timeout (seconds)
0x2f	Word	R/W	Inlet 1 frequency deassertion hysteresis (0.01 Hz)
0x30	Bit Mask	R/W	Inlet 2 enabled voltage thresholds: • Bit 0: Lower critical threshold enabled • Bit 1: Lower warning threshold enabled • Bit 2: Upper warning threshold enabled • Bit 3: Upper critical threshold enabled • Bits 4~15: Reserved
0x31	Word	R/W	Inlet 2 lower critical voltage threshold (0.01 V)
0x32	Word	R/W	Inlet 2 lower warning voltage threshold (0.01 V)
0x33	Word	R/W	Inlet 2 upper warning voltage threshold (0.01 V)
0x34	Word	R/W	Inlet 2 upper critical voltage threshold (0.01 V)
0x35	Word	R/W	Inlet 2 voltage assertion timeout (seconds)
0x36	Word	R/W	Inlet 2 voltage deassertion hysteresis (0.01 V)
0x37	Bit Mask	R/W	Inlet 2 enabled frequency thresholds: • Bit 0: Lower critical threshold enabled • Bit 1: Lower warning threshold enabled • Bit 2: Upper warning threshold enabled • Bit 3: Upper critical threshold enabled • Bits 4~15: Reserved
0x38	Word	R/W	Inlet 2 lower critical frequency threshold (0.01 Hz)
0x39	Word	R/W	Inlet 2 lower warning frequency threshold (0.01 Hz)

Offset	Type	Access	Parameter
0x3a	Word	R/W	Inlet 2 upper warning frequency threshold (0.01 Hz)
0x3b	Word	R/W	Inlet 2 upper critical frequency threshold (0.01 Hz)
0x3c	Word	R/W	Inlet 2 frequency assertion timeout (seconds)
0x3d	Word	R/W	Inlet 2 frequency deassertion hysteresis (0.01 Hz)
0x3e~0xff			Reserved

Inlets

- Up to 16 inlets, 256 holding registers each
- Base address (i = 0..15): 0x3000 + i * 0x0100

Offset	Type	Access	Parameter
0x00	Bit Mask	R	Inlet capabilities (supported sensors): • Bit 0: RMS voltage • Bit 1: RMS current • Bits 3~4: Reserved • Bit 4: Unbalanced current • Bit 5: Active power • Bit 6: Apparent power • Bit 7: Power factor • Bit 8: Active energy counter • Bit 9: Apparent energy counter • Bit 10: Phase angle • Bit 11: Line frequency • Bit 12: Reactive power • Bit 13: Reactive energy counter • Bit 14: Power quality • Bit 15: Surge protector status
0x01	Bit Mask	R	Inlet capabilities (continued): • Bit 0: Residual current • Bits 1~15: Reserved
0x02	Word	R	Number of inlet poles
0x03	Word	R	Minimum voltage rating in V
0x04	Word	R	Maximum voltage rating in V
0x05	Word	R	Current rating in A
0x06~0x07			Reserved
0x08~0x09	Float	R	RMS voltage reading in V
0x0a~0x0b	Float	R	RMS current reading in A
0x0c~0x0f			Reserved
0x10~0x11	Float	R	Unbalanced current reading in %
0x12~0x13	Float	R	Active power reading in W
0x14~0x15	Float	R	Apparent power reading in VA

Offset	Type	Access	Parameter
0x16~0x17	Float	R	Power factor reading (no unit)
0x18~0x1b	QWord	R	Active energy counter in Wh
0x1c~0x1f	QWord	R	Apparent energy counter in VAh
0x20~0x21	Float	R	Phase angle between voltage and current in degrees
0x22~0x23	Float	R	Line frequency reading in Hz
0x24~0x25	Float	R	Reactive power reading in var
0x26~0x29	QWord	R	Reactive energy counter in varh
0x2a	Word	R	Power quality: • 0: Unknown • 1: Normal • 2: Warning • 3: Critical
0x2b~0x2f			Reserved
0x30	Word	R	Surge protector status: • 0: OK • 1: Alarm
0x31	Word	R	Residual current status: • 0: Unknown • 1: Normal • 2: Warning • 3: Critical • 4: Self-Test • 5: Failure
0x32~0x33	Float	R	Residual current reading in A
0x34~0x3f			Reserved
0x40~0x6f			Pole 1 (see section Poles)
0x70~0x9f			Pole 2
0xa0~0xcf			Pole 3

Offset	Type	Access	Parameter
0xd0~0xff			Pole 4

Overcurrent Protectors

- Up to 64 overcurrent protectors, 256 holding registers each
- Base address (i = 0..63): 0x4000 + i * 0x0100
- Trip status is represented by coils 0x0000 to 0x003f (0 = open, 1 = closed)

Offset	Type	Access	Parameter
0x00	Bit Mask	R	Capabilities (supported sensors): • Bit 0: Reserved • Bit 1: RMS current • Bit 2: Peak current • Bits 3~14: Reserved • Bit 15: Trip detection
0x01			Reserved
0x02	Word	R	Number of overcurrent protector poles
0x03~0x04			Reserved
0x05	Word	R	Current rating in A
0x06~0x09			Reserved
0x0a~0x0b	Float	R	RMS current reading in A
0x0c~0x0d	Float	R	Peak current reading in A
0x0e~0x3f			Reserved
0x40~0x6f			Pole 1 (see section Poles)
0x70~0x9f			Pole 2
0xa0~0xcf			Pole 3
0xd0~0xff			Pole 4

Outlets

- Up to 128 outlets, 256 holding registers each
- Base address (i = 0..127): 0x8000 + i * 0x0100
- Outlet state (for switchable units) is controlled by coils 0x0100 to 0x017f (0 = off, 1 = on)

Offset	Type	Access	Parameter
0x00	Bit Mask	R	Outlet capabilities (supported sensors): • Bit 0: RMS voltage • Bit 1: RMS current • Bits 2~3: Reserved • Bit 4: Unbalanced current • Bit 5: Active power • Bit 6: Apparent power • Bit 7: Power factor • Bit 8: Active energy counter • Bit 9: Apparent energy counter • Bit 10: Phase angle • Bit 11: Line frequency • Bit 12: Reactive power • Bit 13: Reactive energy counter • Bit 14: Reserved • Bit 15: Outlet control coil (switchable)
0x01			Reserved
0x02	Word	R	Number of outlet poles
0x03	Word	R	Minimum voltage rating in V
0x04	Word	R	Maximum voltage rating in V
0x05	Word	R	Current rating in A
0x06~0x07			Reserved
0x08~0x09	Float	R	RMS voltage reading in V
0x0a~0x0b	Float	R	RMS current reading in A
0x0c~0x0f			Reserved
0x10~0x11	Float	R	Unbalanced current reading in %
0x12~0x13	Float	R	Active power reading in W
0x14~0x15	Float	R	Apparent power reading in VA

Offset	Type	Access	Parameter
0x16~0x17	Float	R	Power factor reading (no unit)
0x18~0x1b	QWord	R	Active energy counter in Wh
0x1c~0x1f	QWord	R	Apparent energy counter in VAh
0x20~0x21	Float	R	Phase angle between voltage and current in degrees
0x22~0x23	Float	R	Line frequency reading in Hz
0x24~0x25	Float	R	Reactive power reading in var
0x26~0x29	QWord	R	Reactive energy counter in varh
0x2a~0x3f			Reserved
0x40~0x6f			Pole 1 (see section Poles)
0x70~0x9f			Pole 2
0xa0~0xcf			Pole 3
0xd0~0xff			Pole 4

Poles

- Embedded into the register space of inlets, overcurrent protectors and outlets
- The number of poles depends on the pole count register at offset 0x02
- Base addresses for inlet i pole blocks (i=0..15):
  - Pole count: 0x3002 + i * 0x1000
  - Pole 1: 0x3040 + i * 0x0100
  - Pole 2: 0x3070 + i * 0x0100
  - Pole 3: 0x30a0 + i * 0x0100
  - Pole 4: 0x30d0 + i * 0x0100
- Base addresses for overcurrent protector i pole blocks (i=0..63):
  - Pole count: 0x4002 + i * 0x1000
  - Pole 1: 0x4040 + i * 0x0100
  - Pole 2: 0x4070 + i * 0x0100
  - Pole 3: 0x40a0 + i * 0x0100
  - Pole 4: 0x40d0 + i * 0x0100
- Base addresses for outlet i pole blocks (i=0..127):
  - Pole count: 0x8002 + i * 0x1000
  - Pole 1: 0x8040 + i * 0x0100
  - Pole 2: 0x8070 + i * 0x0100
  - Pole 3: 0x80a0 + i * 0x0100
  - Pole 4: 0x80d0 + i * 0x0100

Offset	Type	Access	Parameter
0x00	Bit Mask	R	Pole capabilities (supported sensors): • Bit 0: RMS voltage • Bit 1: RMS current • Bits 2-4: Reserved • Bit 5: Active power • Bit 6: Apparent power • Bit 7: Power factor • Bit 8: Active energy counter • Bit 9: Apparent energy counter • Bit 10: Phase angle • Bit 11: Line frequency • Bit 12: Reactive power • Bit 13: Reactive energy counter • Bits 14~15: Reserved
0x01~0x07			Reserved
0x08~0x09	Float	R	RMS voltage reading in V

Offset	Type	Access	Parameter
0x0a~0x0b	Float	R	RMS current reading in A
0x0c~0x11			Reserved
0x12~0x13	Float	R	Active power reading in W
0x14~0x15	Float	R	Apparent power reading in VA
0x16~0x17	Float	R	Power factor reading (no unit)
0x18~0x1b	QWord	R	Active energy counter in Wh
0x1c~0x1f	QWord	R	Apparent energy counter in VAh
0x20~0x21	Float	R	Phase angle between voltage and current in degrees
0x22~0x23	Float	R	Line frequency reading in Hz
0x24~0x25	Float	R	Reactive power reading in var
0x26~0x29	QWord	R	Reactive energy counter in varh
0x2a~0x2f			Reserved