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Lonbox® PIO4014 Users Manual

PIO4014 energy meter interface module for LonWorks Installations

September 2004

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This manual is intended for use with the Lonbox® PIO4014 software from version 2.0 released September 2004.

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Abstract

This manual provides detailed technical information on the electrical and mechanical interface and operating environment characteristics for the *Prolon Lonbox PIO4014 energy meter interface module.*

This document also provides guidelines for installation and management of the node in a LonWorks® network.

Introduction

The Lonbox® PIO4014 is a module intended for use in building automation or utility management installations. The module has 3-digital pulse counter inputs, 1 EN61107 serial (current loop) input, and a relay output. Each of the inputs can separately be converted to a value presented on the control network. The Lonbox® Series is a range of products that are designed to be cost-effective and interoperable in a building automation installation. The products are designed to be part of a truly distributed control architecture based on the LonMark® standards.

Mounting

Electrical connection

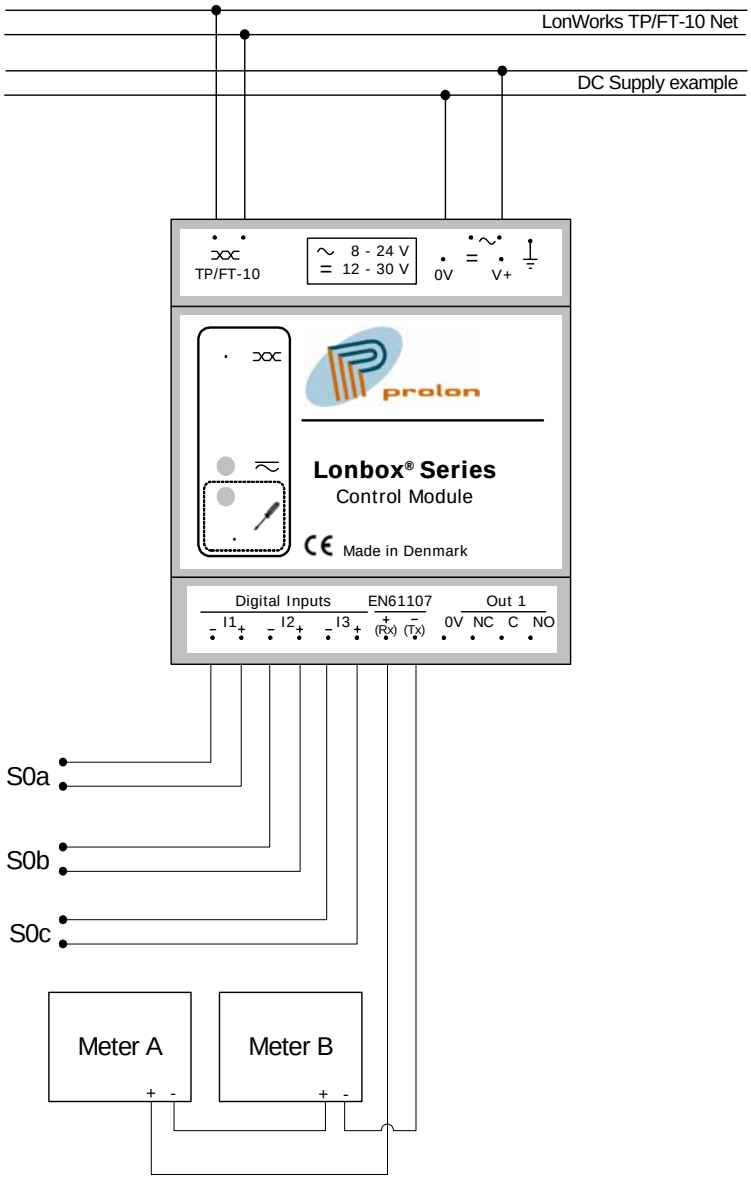


Figure 1 Two serial meters- and with DC supply connection

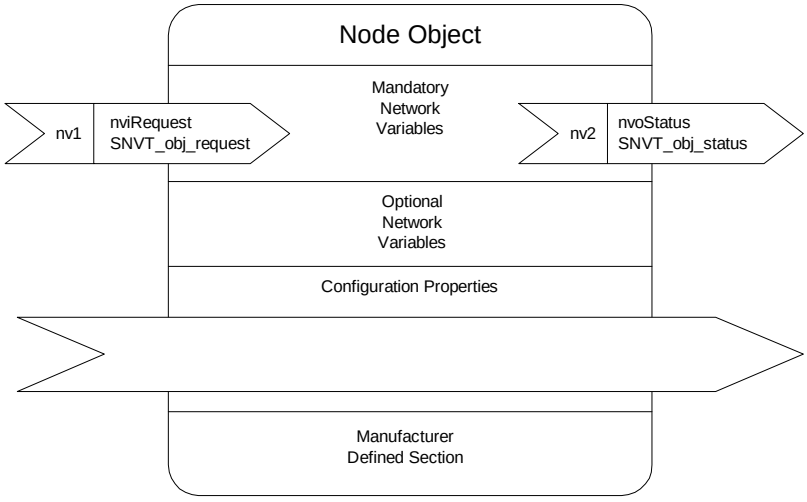
Network Interface

The module contains 21 LonMark® Objects or Functional Blocks. The standard node object used for generic control and the status information from the node. Three Pulse Meter Functional Blocks for pulse counting, sixteen Serial Meter Functional Blocks for transferring meter registers to the network and finally a single Open Loop Actuator object representing the internal relay and its functionality.

Node Object

The Node Object allows the different other functions within a node to be monitored. Upon receiving an update to the nviRequest network variable, the nvoStatus network variable is updated. The definition of SNVT_obj_request includes an object ID field to allow the Node Object to report status and alarm conditions for all objects on a node

The only function available in this node is the standard required status functions available through the node.



The following section defines network variables defined for the node object.

Object Request

network input SNVT_obj_request nviRequest;

The input network variable provides the mechanism to request a particular mode for a particular object within the node. The only supported request codes are RQ_REPORT_MASK and RQ_UPDATE_STATUS.

Object Status

network output SNVT_obj_status nvoStatus;

The output network variable reports the status for any other object on the node. In the Lonbox PIO2004 modules no status, except for the minimum required, are reported through this status variable.

Data are transmitted whenever a value is received on the Object Request input.

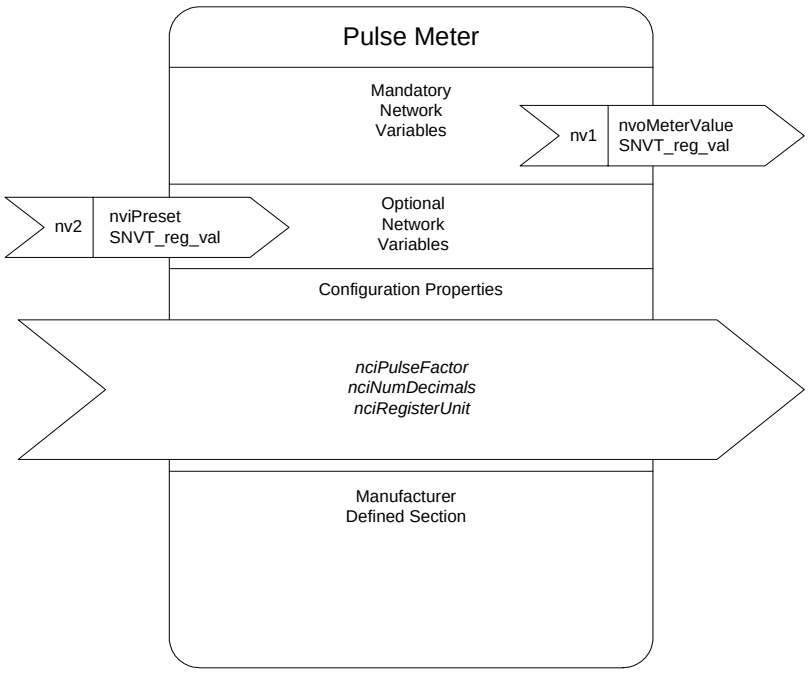
Pulse Meter Functional Blocks

The Pulse Meter Functional Blocks is able to count S0 impulses (IEC62053-31).

The object uses an internal pulse counter value to calculate an analog value. The analog value is calculated based on a scaling factor that is applied to the pulse counter value. To keep the value as precise as possible all internal counting is done in 32-bit integer format and is only converted to the output value when it is presented in a network variable.

To prevent data loss if power is removed, is the module equipped with a power-loss detection circuit and when the power-loss is detected, is the pulse counters saved in the internal Flash memory.

All pulse counting is carried out by a small front-end processor, and the module is therefore able to count pulses even when the node is taken unconfigured or offline.



Register Value Output

network output SNVT_reg_val nvoMeterValue;

This network variable contains the current value of the pulse meter register.

```
typedef struct {
   unsigned raw(4);
   reg_val_unit_t unit;
   unsigned short nr_decimals : 3;
} SNVT_reg_val;
```

The raw output value is a scaled presentation of the internal impulse counter value that is counted on the hardware input. The value is calculated as follows:

nvoMeterValue.raw = (nciPulseFactor.multiplier * pulseCount) / nciPulseFactor.divisor

the calculation is carried out in several steps in order to ensure that the calculations don't cause an overflow on the internal 32-bit integer variables.

Preset Input Value

network input SNVT_reg_val nviPreset;

The preset input can be used to start the register output value on a specific value.

When a network value update is received on the `nviPreset`, the internal raw pulse count is adjusted accordingly, and will indirectly adjust the `nvoMeterValue`.

It is the responsibility of the user to reverse-scale the `nviPreset` value correctly, as of that the `nviPreset` value MUST be a raw pulse counter value.

Pulse Factor Configuration

config network input SNVT_muldiv nciPulseFactor;

Configuration of the value factor that is applied to the raw pulse counter when converting into the scaled register output value.

Number of Decimals Configuration

config network input UCPTregisterNumDecimals nciNumDecimals;

Configures the number of decimals that the register output value must have, the nr_decimals field in the `nvoMeterValue` is set accordingly.

Register Unit Configuration

config network input UCPTregisterValueUnit nciRegisterUnit;

Specifies the unit field in the `nvoMeterValue` structure.

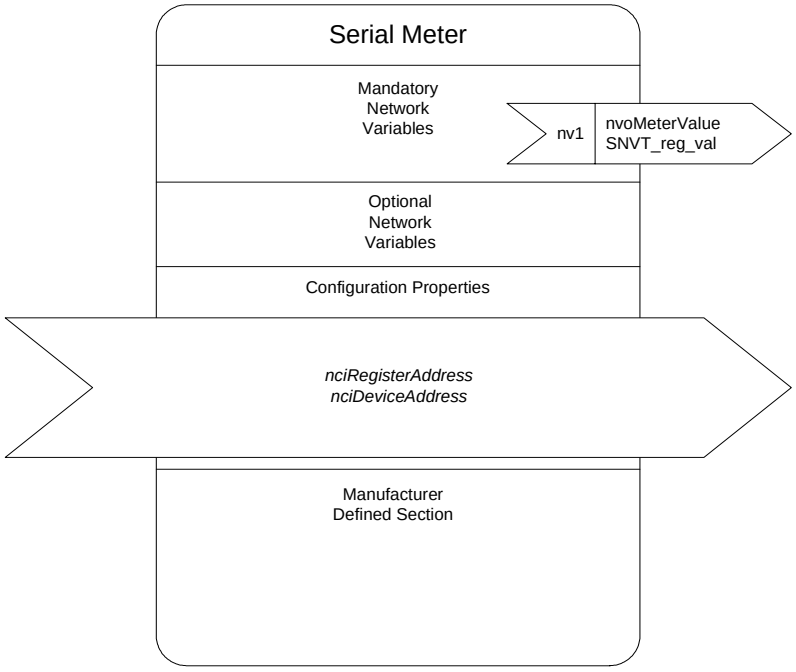
Serial Meter Functional Blocks

The Serial Meter Functional Blocks is able to transfer meter values from a standard meter that comply with the EN 61107 standard.

The meters register values is translated and is the presented on the network in a standard SNVT_reg_val.

The module is able to have a single- or up to 4 serial meters connected on the serial bus (current loop). It is possible to transfer up to 16 register onto the network, but the register allocation is NOT completely free, as of that the each meter address is shared by 4 register addresses. So transferring of meter register values in following combinations are possible:

- With one meter it is possible to read up to 16 registers (same meter address in the 4 address configurations).
- With two meters it is possible to read up to 8 registers per meter.
- With three meters it is possible to read up to 4 registers per meter and on one meter read up to 4 extra registers.
- With four meters it is possible to read up to 4 registers.



Register Value Output

network output SNVT_reg_val nvoMeterValue;

This network variable contains the translated value of the meters register value.

```
typedef struct {
   unsigned raw(4);
   reg_val_unit_t unit;
   unsigned short nr_decimals : 3;
} SNVT_reg_val;
```

The raw field contains the 32-bit integer value, the `nr_decimals` is specifies the decimal point position of the read value from the meter. If the register value contains a unit, then the unit field is filled in accordingly.

Example:

Meter register value:	00492.471*kWh
nvoMeterValue:	raw: 492471 unit: RVU_KWH nr_decimals: 3

Register Address Configuration

config network input UCPTregisterAddress nciRegisterAddress;

This configuration variable specifies the ASCII string of the standard identification number or address of the EN 61107 register, in the form:

"1.8.0"

A maximum of 16 characters can be filled in.

Meter Address Configuration

config network input UCPTdeviceAddress nciDeviceAddr;

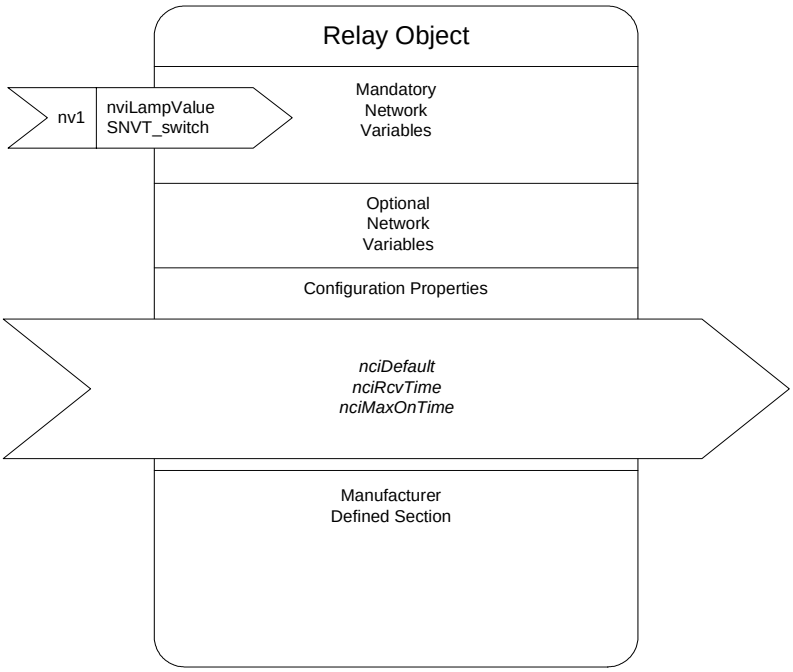
The meter, or device address, is shared between 4 Serial Meter Functional Blocks, so that the first 4 four functional blocks shares the same meter address. If the meter address is filled in on one the blocks, then the `nciDeviceAddr` on three other blocks will automatically show the same address.

A maximum of 30 characters can be filled in the address variable.

Example: "76332292"

Relay Object

The Relay object is compliant with the LonMark® Open-Loop Actuator object.



Relay Input

network input SNVT_switch nviLampValue;

This input variable can be used to switch the relay ON or OFF.

Default Lamp Value Configuration

config network input SNVT_switch nciDefault;

This configuration variable specifies the value that will be assigned to `nviLampValue` if the `nciRcvTime` expires.

Receive Time Configuration

config network input UCPTmaxRcvTimeMin nciRcvTime;

This configuration variable specifies a timeout for the period for when the `nviLampValue` must be activated, if there hasn't been a write to nviLampValue (probably an OFF value) for at least `nciRcvTime` period (default 1.440 minutes = 24 hours), then the relay is activated by using the value from `nciDefault`.

Maximum ON Time Configuration
config network input SNVT_time_sec nciMaxOnTime;

This configuration variable specifies the maximum time that the relay is activated. The relay is automatically set to OFF when `nciMaxOnTime` expires.

Electrical Specifications

Control Circuit			
Microprocessor	Neuron® 3120 Chip		
Transceiver Type	TP/FT-10 compliant (FTT-10A)		
Crystal Oscillator Clock	10 MHz		
Service indicator	Yellow LED	Applicationless: Unconfigured: Configured:	On Flashing Off
Operating voltage	12-28 VDC		
Operating current	Typ. 40 mA @ 24VDC		

Insulation	
Network to power supply	FTT-10A component specific
Power supply to inputs	None
Power supply to outputs	None

EMC	
Immunity	According to EN 50082-2 8 kV air 4 kV contact
- Electromagnetic field	10 V/m
- Fast transient	1 kV
Emission	According to EN 50081-1

Temperature	
Operating	-10 °C to + 55 °C
Storage	-20 °C to + 70 °C

Electromagnetic compatibility

EC Declaration of conformity CE

Manufacturer:

Company Name:	Prolon Control Systems
Address:	Herstedvesterstraede 56 DK-2620 Albertslund Denmark
Telephone:	+45 4366 8060

Hereby declare that

Product:

Name:	Lonbox® PIO4014
Type:	Energy Meter Interface

- is in conformance with:

COUNCIL DIRECTIVE of 3. May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility (89/336/EEC)

was manufactured in conformity with the following national standards that implements a harmonized standard:

EN 50081-1
Electromagnetic compability - Generic emission standard. Part 1: Residential, commercial and light industry.

EN 50082-2
Electromagnetic compability - Generic immunity standard. Industry

Date: 23-09-2004

Place: Copenhagen Signed: _____

Kim T. Nielsen - General Manager

References

- *LonMark™ Application Layer Interoperability Guidelines*
- *LonWorks™ Custom Node Development* engineering bulletin
- *Motorola* LonWorks technology device data
- EN 50081-1, Electromagnetic emission
- EN 50082-1, Electromagnetic immunity
- LonWorks® FTT-10A Free Topology Transceiver User's Guide