

LM6I2O PLC	Project Document Department	I+D / R&D
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VERSION CONTROL

Version	Data	Author	Comments
1	11/11/2010	JMS	Original version
2	16/11/2010	JAZ	We have included a new list of references
3	15/12/2010	JDF	There is a new list of MODBUS commands
4	08/02/2011	JDF	We have modified the events
5	09/02/2011	JDF	We have specified the version of "Circutor PLC protocol"

1. General description

1.1. Description

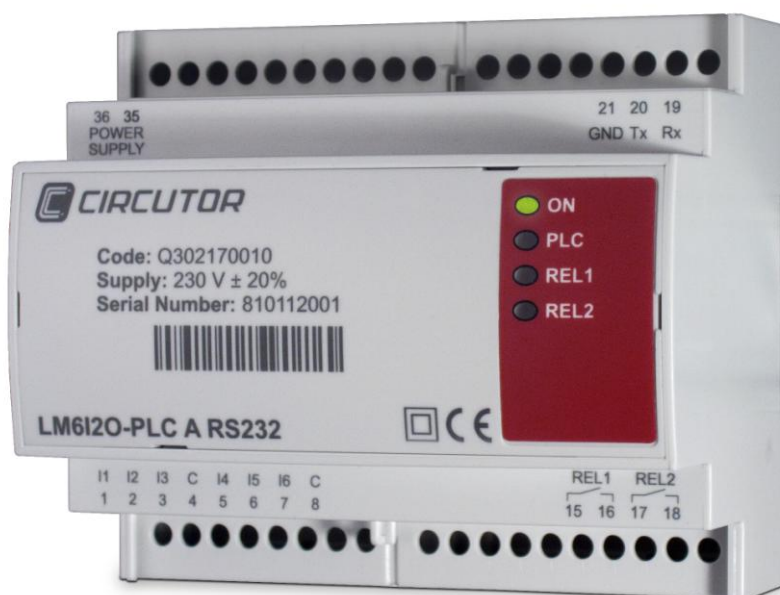
The LM6I2O is a device designed to concentrate the pulses coming from external devices with outputs according with EN62053-31. It has also two relays that we can control remotely. These operations may be performed using an electrical communication channel (RS232 or RS485 depending on version) and / or working with PLC (Power Line Communications) system operating at DCSK CENELEC A or B bands.

1.2. General function

The LM6I2O is able to:

- Read and collect the pulses from each one of its 6 inputs.
- Create the TOU (Time of use) of each pulse input.
- Generate daily summaries of each absolute count input.
- Generate monthly billing closures of each count input.
- Manage outputs through serial communications commands received via an electrical or PLC channel.
- Send the status of outputs.

1.3. Physical aspect



2. Product interface

2.1. Product usage environment

This product is used in applications where you want to concentrate pulses from water, gas or electricity meter.

Another possible application could be to read the pulses from six different magnitudes of energy (active consumed and generated, and reactive in quadrants 1, 2, 3 and 4) generated by electro mechanical meters or an electronic one without PLC communications.

2.2. User interface

The LM6I2O interface consists of 4 LED's with the functions described below.

2.2.1. LED ON

This green LED indicates that the device is powered.

2.2.2. LED PLC

Read LED indicating the status of the PLC:

- OFF: PLC no connected
- LED ON: PLC connected

2.2.3. LED's REL1 y REL2

They indicate the status of each one of the two output relays. "On" indicates that the output is closed and "Off" that the output is open.

2.3. Communications interface

2.3.1. Communications protocol

The device uses MODBUS RTU protocol (www.modbus.org).

The format for communications is:

Peripheral	Function	Data	CRC
1 byte	1 byte	N x 1 bytes	2 bytes

When you use PLC communications you are working also with MODBUS RTU protocol but it is encapsulated by CirPLC (see protocol specifications CirPLC). To maintain compatibility with PLC800 and LM4, you can also use the "Circutor PLC protocol" version 1,14 or using the RS-232 or RS-485, the communication configuration is 9600 baud 8N1.

2.3.2. Modbus commands

- Read / Write time.
 - Function: 04h / 10h
 - Address: 0000h
 - Data: 6 registers (day, month, year, hour, minute and seconds)
- Read / Write Modbus address
 - Function: 04h / 10h
 - Address: 0008h
 - Data: 1 register
- Read / Write load profile time.
 - Function: 04h / 10h
 - Address: 000Ah
 - Data: 1 register
- Read / Write closing bill date.
 - Function: 04h / 10h
 - Address: 000Ch
 - Data: 1 register (254=disable, 255=last day of month)
- Read / Write change the daylight saving.
 - Function: 04h / 10h
 - Address: 0010h

- Data: 1 register (0=Automatic, 1=Manual)
- Read / Write change summer → winter time
 - Function: 04h / 10h
 - Address: 0011h
 - Data: 6 registers (day, month, year, hour, minute and seconds)
- Read / Write change winter → summer time
 - Function: 04h / 10h
 - Address: 0017h
 - Data: 6 registers (day, month, year, hour, minute and seconds)
- Read inputs status
 - Function: 04h
 - Address: 0020h
 - Data: 1 register (binary: I6 I5 I4 I3 I2 I1 with LSB I1)
- Read / Write output
 - Function: 04h / 10h
 - Address: 0030h
 - Data: 1 register (en binary: S2 S1 con LSB S1)
- Read LM6I2O version
 - Function: 04h
 - Address: 0050h
 - Data: 3 registers
- Read serial number of LM6I2O.
 - Function: 04h
 - Address: 0060h
 - Data: 2 registers
- Read count records (RC)
 - Function: 04h
 - Address: 0100h
 - Data: 12 registers (two registers per input, from input 1 to input 6)
- Reset of all registers (RC, RDH y RRM)
 - Function: 05h
 - Address: 0100h

- Write the starting date for the reading the TOU registers
 - Function: 10h
 - Address: 0200h
 - Data: 6 registers (day, month, year, hour, minute and seconds)
- Write the ending date for the reading of the TOU register
 - Function: 10h
 - Address: 0206h
 - Data: 6 registers (day, month, year, hour, minute and seconds)
- Read the TOU register
 - Function: 04h
 - Address: 0210h
 - Data: 19 register (6 time registers, 12 registers, the 6 inputs and the qualifier register). The reading index is reset when we write the starting and the ending date and it is automatically increased at each reading. If there are no more records to read it returns the error code "Illegal data address"
- Writing the starting date to read monthly summary records
 - Function: 10h
 - Address: 0300h
 - Data: 6 registers (day, month, year, hour, minute and seconds)
- Write the ending date to read monthly summary record
 - Function: 10h
 - Address: 0306h
 - Data: 6 registers (day, month, year, hour, minute and seconds)
- Read the monthly summary record (RRM)
 - Function: 04h
 - Address: 0310h
 - Data: 19 register (6 time registers, 12 register for 6 inputs and qualifier). The reading index is reset when we write the starting and the ending date and it is automatically increased at each reading. If there are no more records to read it returns the error code "Illegal data address"
- Write the starting date to read the event log.
 - Function: 10h

- Address: 0400h
 - Data: 6 registers (day, month, year, hour, minute and seconds)
- Write the ending date to read the event log.
 - Function: 10h
 - Address: 0406h
 - Data: 6 registers (day, month, year, hour, minute and seconds)
- Read event registers.
 - Function: 04h
 - Address: 0410h
 - Data: 7 register (6 time registers and one of events). The reading index is reset when we write the starting and the ending date and it is automatically increased at each reading. If there are no more records to read it returns the error code "Illegal data address"
- General LM6I2O reset
 - Function: 05h
 - Address: F000h
- Read / Write serial number
 - Function: 04h / 10h
 - Address: F000h
 - Data: 2 registers
- Read / Write modem
 - Function: 04h / 10h
 - Address: F010h
 - Data: 6 registers (12 characters)
- Read
 - Function: 04h
 - Address: F020h
 - Data: 1 register
- Read
 - Function: 04h
 - Address: F030h
 - Data: 6 registers (day, month, year, hour, minute and seconds)

- Read
 - Function: 04h
 - Address: F040h
 - Data: 2 registers
- Read / Write clock set
 - Function: 04h / 10h
 - Address: F050h
 - Data: 3 registers
- Reading internal temperature
 - Function: 04h
 - Address: F080h
 - Data: 1 register
- Read last date synchronization
 - Function: 04h
 - Address: F090h
 - Data: 6 registers (day, month, year, hour, minute and seconds)
- Read alarm status
 - Function: 04h
 - Address: F0A0h
 - Data: 1 register (binary: A3 A2 A1 with A1 alarm the serial flash, A2 glass alarms and A3 PLC alarm PLC)
- Read
 - Function: 04h
 - Address: F0B0h
 - Data: 1 register (binary: A2 A1 with A1 alarm ON (flashes to 512Hz) (A2 LED status PLC)
- PLC Reset
 - Function: 05h
 - Address: F100h
- Read if the PLC is in firmware mode
 - Function: 04f

- Address: F100h
 - Data: 1 register (0=normal, 1=firmware)
- Read if the PLC modem is connected
 - Function: 04h
 - Address: F101h
 - Date: 1 register (0=not connected, 1=connected)
- Read frequency band of the modem PLC
 - Function: 04h
 - Address: F102h
 - Date: 1 register (2=CENELAC A, 3=CENELEC B)
- Read PLC modem version
 - Function: 04h
 - Address: F103h
 - Data: 1 registers

2.4. Physical interface

2.4.1. Pulse counter record

- Input 1
- Input 2
- Input 3
- Common
- Input 4
- Input 5
- Input 6
- Common

2.4.2. Output Relay

- Output 1 A
- Output 1 B
- Output 2 A
- Output 2 B

2.4.3. Communication

- TX / A
- RX / B
- GND

2.4.4. Power Supply

- Phase
- Neutral

2.5. Front label description



3. Detailed description

3.1. Tariff system

3.1.1. Counter register (RC)

The LM6I2O has 6 different registers where the number of pulses is recorded. At the manufacturing process all this registers are reset, so the original value is zero.

3.1.2. Register time discrimination (RDH).

The device has an hourly load profile where we can save the value of the six inputs every hour. This profile will be rotary with a depth of 2160 records, 24 records per day, it means 3 months. In this register is also stored a qualifier of quality.

3.1.3. Monthly summary record (RRM).

The first day of each month (or whatever is set) at 00:00, the LM6I2O makes a closing or a summary of the values of the six inputs. These summaries are working in a rotary format with a depth of 12 closings.

3.2. Events

The device will record the different events that occur on a rotary file, with a total of 200 events

This is the list of events:

- Power Supply OFF (event code → 1)
- Start up after power failure (event code → 2)
- Change time, last time (event code → 3)
- Change time, new time (event code → 4)
- Change parameters (event code → 5)
- Reset device (event code → 6)
- LM6I2O Update (event code → 7)
- PLC Update (event code → 8)
- Enable output 1 (event code → 9)
- Enable output 2 (event code → 10)
- Disable output 1 (event code → 11)
- Disable output 2 (event code → 12)
- Enable input 1 (event code → 13)
- Enable input 2 (event code → 14)
- Enable input 3 (event code → 15)
- Enable input 4 (event code → 16)
- Enable input 5 (event code → 17)
- Enable input 6 (event code → 18)
- Disable input 1 (event code → 19)
- Disable input 2 (event code → 20)
- Disable input 3 (event code → 21)
- Disable input 4 (event code → 22)

- Disable input 5 (event code → 23)
- Disable input 6 (event code → 24)

3.3. Setup variables

3.3.1. Model

It is based on a 16 ASCII characters string.

4. Technical characteristics

4.1. Electric characteristics

Power Supply

Rated voltage	230V AC, 3x230/400V AC, 600V DC
Tolerance	± 20%
Consumption	< 20VA
Frequency	50/60Hz
Working temperature	-25 °C a + 70 °C

Memory

Data	Type RAM with supported EEPROM
Setup	Non-volatile FLASH memory type

Battery (optional)

Type	Lithium
Life	>15 years

Clock

Type	Quart oscillator
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Digital inputs

Type	Transistor
Compatibility	EN62053-31
Maximum pulses per second	8
Pulse minimum width	25ms
Pulse maximum width	3s
Maximum impedance of the pulse generator (active)	1kΩ
Activated input	Input and common short-circuited
Not activated input	Input and common open

Digital outputs

Type	Mechanical
Contact features	5 A @ 230V

Communication channel

Type	RS232 ó RS485 depending on the model
Baudrate	9600 bauds
Protocol	MODBUS RTU

PLC communications

Type	DCSK CENELEC bad A & B
Baudrate	2400 bauds
Protocol	CirPLC

Mechanical features

Type	DIN format
IP protections	IP20 for the terminals & IP41 for the cover.

4.2. Dimensions

