LUMINANCE PHOTOMETER

SFLINT

COMMUNICATIONS PROTOCOL

sifisa

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c/muro 23, 1º izqda. - 47004 valladolid
tel 983 37 10 29 / 983 37 36 11
fax 983 37 01 95

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INTRODUCTION

Communications between SFLINT luminance measurement modules and the computer or PLC that controls the tunnel lighting levels, are made through a RS-485 bus at 1200 bauds, 8 data bits, no parity, 1 stop bit and a master-slave architecture, where PLC is the master and the SFLINT modules are slaves.

The PLC or computer must connect to every luminance photometer in order to set measurement cycle time and to get those data. The number of available commands is very small, to simplify its programming. These commands are:

- Set cycle time (default at start up and at every power on: 5 minutes)
- Get programmed cycle time.
- Get instant measurement.
- Get average measurement.

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Every luminance photometer has a fixed address in the RS-485 net, that appears on a label on the equipment. So, master (PLC) has to select which slave (SFLINT) is connecting with including this address in the command message and waiting for its answer.

Data access is made through a virtual exchange memory. So, set a parameter is like a writing operation, and get a value is a reading one.

Multibyte data will be encoded using *Little Endian* or Intel notation: Less significant byte in first place.

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Exchange area:

Address	Size (bytes)	Meaning	Range	Access
0	1	Length of measurement cycle, in minutes	1 – 60	R/W
2	4	Instant luminance, in cd/m^2	0 - ... (4 bytes)	Read
6	4	Average luminance, in cd/m^2	0 - ... (4 bytes)	Read

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WRITING COMMANDS

@cddwmnbb... bcc

Every byte represents a byte as follows:

@	Message start flag
c	Number of bytes sent
dd	Destiny module address
w	Type of command: "w" writing
m	Address of exchange memory
n	Number of data bytes sent
bb... b	Data bytes
cc	CRC16 of message

If there is no communication problem, the answer will be:

#cddwmncc

#	Answer start flag
c	Number of bytes sent
dd	Origin module address
w	Type of command done: "w" writing
m	Address of exchange memory
n	Number of data bytes written
cc	CRC16 of message

Only writing cycle time is available on SFLINT.

For example, if you want to set a 10 minutes cycle time and luminance photometer address is 15, command will be as follows:

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Hexadecimal: 40 0A 0F 00 77 00 01 0A 34 EC

Decimal	Hexadecimal	Meaning
64	40	Message start flag: '@'
10	0A	Number of bytes sent: 10
15 0	0F 00	Destiny module address: 15 (two bytes)
119	77	Type of command: 'w', writting
0	00	Start of exchange memory: 0, cycle time address.
1	01	Number of data bytes sent: 1
10	0A	Data byte: 10 minutos
60468	34 EC	CRC16 of message: See appendix

The answer, if there is no communication problem, will be:

Hexadecimal: 23 09 0F 00 77 00 01 37 80

Decimal	Hexadecimal	Meaning
35	23	Message start flag: '#'
9	09	Number of bytes sent: 9
15 0	0F 00	Origin module address: 15 (two bytes)
119	77	Type of command done: 'w', writing
0	00	Start of exchange memory: 0, cycle time address.
1	01	Number of data bytes written: 1
32823	37 80	CRC16 of message: See appendix

READING COMMANDS

@cddrmncc

Every character represents a byte as follows:

@	Message start flag
c	Number of bytes sent
dd	Destiny module address
r	Type of command: "r" reading
m	Start of exchange memory
n	Number of data bytes requested
cc	CRC16 of message

If there is no problem, the answer will be:

#cddrmnbb... bcc

#	Message start flag
c	Number of bytes sent
dd	Origin module address
w	Type of command done, "r" reading
m	Start of exchange memory
n	Number of data bytes read
bb... b	Data bytes
cc	CRC16 of message

Some examples of these commands and their answers.

The command to get cycle time of the luminance photometer number 15 will be:

Hexadecimal: 40 09 0F 00 72 00 01 74 87

Decimal	Hexadecimal	Meaning
64	40	Message start flag: '@'
9	09	Number of bytes sent: 9
15 0	0F 00	Destiny module address: 15 (two bytes)
114	72	Type of command: 'r', reading
0	00	Start of exchange memory: 0, cycle time address.
1	01	Number of bytes requested: 1
34676	74 87	CRC16 of message: See appendix

The answer will be:

Hexadecimal: 23 0A 0F 00 72 00 01 0A 72 1D

Decimal	Hexadecimal	Meaning
35	23	Message start flag: '#'
10	0A	Number of bytes sent: 10
15 0	0F 00	Origin module address: 15 (two bytes)
114	72	Type of command done: 'r' reading
0	00	Start of exchange memory: 0, cycle time address.
1	01	Number of data bytes read: 1
10	0A	Data bytes: 10 minutes
7538	72 1D	CRC16 of message: See appendix

To get instant luminance from an equipment with address 43, the command will be:

Hexadecimal: 40 09 2B 00 72 02 04 C5 E3

Decimal	Hexadecimal	Meaning
64	40	Message start flag: '@'
9	09	Number of bytes sent: 9
43 0	2B 00	Destiny module address: 43 (two bytes)
114	72	Type of command: 'r', reading
2	02	Start of exchange memory: 2, instant luminance address.
4	04	Number of data bytes requested: 4
58309	C5 E3	CRC16 of message: See appendix

If instant luminance is 543 cd/m^2, the answer will be:

Hexadecimal: 23 0D 2B 00 72 02 04 1F 02 00 00 DB BE

Decimal	Hexadecimal	Meaning
35	23	Message start flag: '#'
13	0D	Number of bytes sent: 13
43 0	2B 00	Origin module address: 43 (two bytes)
114	72	Type of command done: 'r' reading
2	02	Start of exchange memory: 2, instant luminance address
4	04	Number of data bytes read: 4
543	1F 02 00 00	Data bytes: 543 cd/m^2
48859	DB BE	CRC16 of message: See appendix

Finally, to get average luminance if address is 321, the command will be:

Hexadecimal: 40 09 41 01 72 06 04 DE D6

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Decimal	Hexadecimal	Meaning
64	40	Message start flag: '@'
9	09	Number of bytes sent: 9
321	41 01	Destiny module address: 321
114	72	Type of command: 'r', reading
6	06	Start of exchange memory: 6, average luminance address.
4	04	Number of data bytes requested: 4
55006	DE D6	CRC16 of message: See appendix

The answer, if average luminance is 1548 cd/m^2, will be:

Hexadecimal: 23 0D 41 01 72 06 04 0C 06 00 00 88 11

Decimal	Hexadecimal	Meaning
35	23	Message start flag: '#'
13	0D	Number of bytes sent: 13
321	41 01	Origin module address: 321
114	72	Type of command done: 'r' reading
6	06	Start of exchange memory: 6, average luminance address
4	04	Number of data bytes read: 4
1548	0C 06 00 00	Data bytes: 1548 cd/m^2
4488	88 11	CRC16 of message: See appendix

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APPENDIX: CRC CALCULATION

```
/*
 * CRC computation logic
 *
 * The logic for this method of calculating the CRC 16 bit polynomial is taken
 * from an article by David Schwaderer in the April 1985 issue of PC Tech
 * Journal.
 */

static short      crctab[] =     /* CRC lookup table */
{
 0x0000, 0xC0C1, 0xC181, 0x0140, 0xC301, 0x03C0, 0x0280, 0xC241,
 0xC601, 0x06C0, 0x0780, 0xC741, 0x0500, 0xC5C1, 0xC481, 0x0440,
 0xCC01, 0x0CC0, 0x0D80, 0xCD41, 0x0F00, 0xCFC1, 0xCE81, 0x0E40,
 0x0A00, 0xCAC1, 0xCB81, 0x0B40, 0xC901, 0x09C0, 0x0880, 0xC841,
 0xD801, 0x18C0, 0x1980, 0xD941, 0x1B00, 0xDBC1, 0xDA81, 0x1A40,
 0x1E00, 0xDEC1, 0xDF81, 0x1F40, 0xDD01, 0x1DC0, 0x1C80, 0xDC41,
 0x1400, 0xD4C1, 0xD581, 0x1540, 0xD701, 0x17C0, 0x1680, 0xD641,
 0xD201, 0x12C0, 0x1380, 0xD341, 0x1100, 0xD1C1, 0xD081, 0x1040,
 0xF001, 0x30C0, 0x3180, 0xF141, 0x3300, 0xF3C1, 0xF281, 0x3240,
 0x3600, 0xF6C1, 0xF781, 0x3740, 0xF501, 0x35C0, 0x3480, 0xF441,
 0x3C00, 0xFCC1, 0xFD81, 0x3D40, 0xFF01, 0x3FC0, 0x3E80, 0xFE41,
 0xFA01, 0x3AC0, 0x3B80, 0xFB41, 0x3900, 0xF9C1, 0xF881, 0x3840,
 0x2800, 0xE8C1, 0xE981, 0x2940, 0xEB01, 0x2BC0, 0x2A80, 0xEA41,
 0xEE01, 0x2EC0, 0x2F80, 0xEF41, 0x2D00, 0xEDC1, 0xEC81, 0x2C40,
 0xE401, 0x24C0, 0x2580, 0xE541, 0x2700, 0xE7C1, 0xE681, 0x2640,
 0x2200, 0xE2C1, 0xE381, 0x2340, 0xE101, 0x21C0, 0x2080, 0xE041,
 0xA001, 0x60C0, 0x6180, 0xA141, 0x6300, 0xA3C1, 0xA281, 0x6240,
 0x6600, 0xA6C1, 0xA781, 0x6740, 0xA501, 0x65C0, 0x6480, 0xA441,
 0x6C00, 0xACC1, 0xAD81, 0x6D40, 0xAF01, 0x6FC0, 0x6E80, 0xAE41,
 0xAA01, 0x6AC0, 0x6B80, 0xAB41, 0x6900, 0xA9C1, 0xA881, 0x6840,
 0x7800, 0xB8C1, 0xB981, 0x7940, 0xBB01, 0x7BC0, 0x7A80, 0xBA41,
 0xBE01, 0x7EC0, 0x7F80, 0xBF41, 0x7D00, 0xBDC1, 0xBC81, 0x7C40,
 0xB401, 0x74C0, 0x7580, 0xB541, 0x7700, 0xB7C1, 0xB681, 0x7640,
 0x7200, 0xB2C1, 0xB381, 0x7340, 0xB101, 0x71C0, 0x7080, 0xB041,
 0x5000, 0x90C1, 0x9181, 0x5140, 0x9301, 0x53C0, 0x5280, 0x9241,
 0x9601, 0x56C0, 0x5780, 0x9741, 0x5500, 0x95C1, 0x9481, 0x5440,
 0x9C01, 0x5CC0, 0x5D80, 0x9D41, 0x5F00, 0x9FC1, 0x9E81, 0x5E40,
 0x5A00, 0x9AC1, 0x9B81, 0x5B40, 0x9901, 0x59C0, 0x5880, 0x9841,
 0x8801, 0x48C0, 0x4980, 0x8941, 0x4B00, 0x8BC1, 0x8A81, 0x4A40,
 0x4E00, 0x8EC1, 0x8F81, 0x4F40, 0x8D01, 0x4DC0, 0x4C80, 0x8C41,
 0x4400, 0x84C1, 0x8581, 0x4540, 0x8701, 0x47C0, 0x4680, 0x8641,
 0x8201, 0x42C0, 0x4380, 0x8341, 0x4100, 0x81C1, 0x8081, 0x4040
};
```

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```
/*
 * Update a CRC check on the given buffer.
 * SEED IS 0, NOT FFFF AS IN MODBUS
 */

int
crcbuf(crc, len, buf)
        register int     crc;     /* running CRC value */
        register u_int  len;
        register u_char         *buf;
{
        register u_int  i;

        for (i=0; i<len; i++)
                crc = ((crc >> 8) & 0xff) ^ crctab[(crc ^ *buf++) & 0xff];

        return (crc);
}
```

The specifications and design of this product are subject to change without notice, due to improvement.