CAN PROTOCOL DESCRIPTION

evolase Oy

PLD-CW-2000H-ZIF

PRECISION CONSTANT CURRENT **LASER DIODE DRIVER**

Key Features

- Special Design for 10/14 pin Butterfly Laser Diode
- High Precision Constant Current Mode
- Output Current up to 2000 mA
- High Current Stability: 0.01 mA
- Control interfaces USB, RS-232, CAN
- LabView compatible
- Python libraries
- Analog and Digital full current amplitude Modulation
- Optical power stabilization mode
- On-Board TEC Controller
- Regulated Maximum TEC Current
- Hi precision temperature stability: 0.01 deg
- 5Vdc Input Power
- Completed by Heatsink
- Compact Size 100 mm × 85 mm × 31 mm

Evolase Oy
Kivipolku 1
56100 Ruokolahti, Finland
Tel. +358 41 477 47 81
VAT 32417214
evolase.com

PLD-CW-2000(H)-ZIF CAN Protocol Description

Introduction

This document describes how data is received and transmitted via CAN addressed systems. This document is based on firmware version PLD-CW-2000.

CAN frame format

The device uses CAN 2.0A with 11-bit identifiers. The baud rate is 500 kBit/s.

Identifiers

Each CAN message has an identifier (ID). A base ID can be set as a parameter (default is 0x001). User can change the base ID using micro USB connection in cases when the information about base ID is lost for example.
The host ID is always 0x22.

Message format

Message length is always 8 bytes, unless declared differently in the description. Message byte and bit numbering is zero based.

Table 1. Message format example

CAN format	ID	DLC	B[0]	B[1]	B[2]	B[3]	B[4]	B[5]	B[6]	B[7]
Formal description	Base ID	Data size	CMD	Sender ID	0	0	Value byte	Value byte	Value byte	Value byte
Example	0x001	0x08	0x11	0x22	0x00	0x00	0x00	0x00	0x00	0x64

Response description

Most of the commands has two types. The SET type and GET type. GET type forms from SET type CMD byte plus 0x80.

For example, if SET type CMD=0x10, then same GET type CMD+0x80 = 0x90.

If device received SET command type CMD it will send ACK response with the same CMD byte with empty value bytes.

If device received GET command type CMD+0x80, it will send ANSWER response with the same CMD+0x80 with corresponding value bytes

Response description

Most of the commands has two types. The SET type and GET type. GET type forms from SET type <cmd> byte plus 0x80. For example if SET type <cmd>=0x10, then same GET type <cmd+0x80>=0x90.

If device received SET command type <cmd>, it will send ACK response with the same <cmd> byte with empty value bytes.

If device received GET command type <cmd+0x80>, it will send ACK response with the same <cmd+0x80> with corresponding value bytes.

Command list

ALL device commands are listed in Table 2.

Table 2. Commands list

<table>
<tr><th>CMD</th><th>CMD description</th><th>Read/Write</th></tr>
<tr><td>0x10</td><td>
ON/OFF laser emitting command

Value:
• 0 – turn laser emitting off
• 1 – turn laser emitting on

Example:
Command to turn laser emitting on:
<table>
<tr><td>0x001</td><td>0x08</td><td>0x10</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x01</td></tr>
</table>
Response ACK:
<table>
<tr><td>0x022</td><td>0x08</td><td>0x10</td><td>0x01</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td></tr>
</table>
Command to GET emitting on/off state:
<table>
<tr><td>0x001</td><td>0x08</td><td>0x90</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td></tr>
</table>
Response ANSWER:
<table>
<tr><td>0x022</td><td>0x08</td><td>0x90</td><td>0x01</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x01</td></tr>
</table>
Value = 1;
</td><td>R/W</td></tr>
<tr><td>0x11</td><td>
Laser diode current command
Current value range 0..2000 mA

Value: integer value bytes multiplied with 100
NOTE: ANSWER for GET command is multiplied with 10000

Example:
Command to SET current value 1500mA,
Value = 150 * 100 = 15000 (0x3A98):
<table>
<tr><td>0x001</td><td>0x08</td><td>0x11</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x3A</td><td>0x98</td></tr>
</table>
Response ACK:
<table>
<tr><td>0x022</td><td>0x08</td><td>0x11</td><td>0x01</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td></tr>
</table>
Command to GET current value 10mA:
<table>
<tr><td>0x001</td><td>0x08</td><td>0x91</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td></tr>
</table>
Response ANSWER:
<table>
<tr><td>0x022</td><td>0x08</td><td>0x91</td><td>0x01</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x01</td><td>0x86</td><td>0xA0</td></tr>
</table>
Value = (0x186A0) = 100000 / 10000 = 10mA;
</td><td>R/W</td></tr>
</table>

<table>
<tr><th>CMD</th><th>CMD description</th><th>Read/Write</th></tr>
<tr><td>0x12</td><td>

Laser diode temperature command

Value: integer value bytes multiplied with 100
NOTE: ANSWER for GET command is multiplied with 10000

Example:
Command to SET temperature value 25.2°C,
Value = 25.2 * 100 = 2520 (0x9D8):

0x001	0x08	0x12	0x00	0x00	0x00	0x00	0x00	0x09	0xD8

Response ANSWER:

0x022	0x08	0x12	0x01	0x00	0x00	0x00	0x00	0x00	0x00

Command to GET temperature value:

0x001	0x08	0x92	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Response ANSWER:

0x022	0x08	0x92	0x01	0x00	0x00	0x00	0x03	0xD8	0x60

Value = (0x3D860= 252000 / 10000 = 25.2°C;

</td><td>R/W</td></tr>
<tr><td>0x14</td><td>

Output power command

Value: integer value of output power multiplied with 100

Example:
Command to GET output power value 5mW:

0x001	0x08	0x94	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Response ANSWER:

0x022	0x08	0x94	0x01	0x00	0x00	0x00	0x00	0x01	0xF4

Value = (0x1F4) = 500 /100 = 5mW;

</td><td>R</td></tr>
<tr><td>0x15</td><td>

Thermistor beta command

Value: integer value of thermistor beta

Example:
Command to SET beta value of thermistor 3984 (0x0F90):

0x001	0x08	0x15	0x00	0x00	0x00	0x00	0x00	0x0F	0x90

Response ACK:

0x022	0x08	0x15	0x01	0x00	0x00	0x00	0x00	0x00	0x00

Command to GET beta value of thermistor:

0x001	0x08	0x95	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Response ANSWER:

0x022	0x08	0x95	0x01	0x00	0x00	0x00	0x00	0x0F	0x90

Value = (0x0F90) = 3984;

</td><td>R/W</td></tr>
</table>

<table>
<tr><th>CMD</th><th>CMD description</th><th>Read/Write</th></tr>
<tr><td>0x16</td><td>

Thermistor resistance command

Value: integer value of thermistor resistance at 25°C

Example:
Command to SET thermistor resistance value 10000Ohm (0x2710):

0x001	0x08	0x16	0x00	0x00	0x00	0x00	0x00	0x27	0x10

Response ACK:

0x022	0x08	0x16	0x01	0x00	0x00	0x00	0x00	0x00	0x00

Command to GET thermistor resistance value:

0x001	0x08	0x96	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Response ANSWER:

0x022	0x08	0x96	0x01	0x00	0x00	0x00	0x00	0x27	0x10

Value = (0x2710) = 10000Ohm;

</td><td>R/W</td></tr>
<tr><td>0x17</td><td>

Monitor responsivity command

Value: integer value of monitor responsivity multiplied with 100

Example:
Command to SET monitor responsivity value 47,5uA/mW,
Value = 47,5 * 100 = 4750 (0x128E):

0x001	0x08	0x17	0x00	0x00	0x00	0x00	0x00	0x12	0x8E

Response ACK:

0x022	0x08	0x17	0x01	0x00	0x00	0x00	0x00	0x00	0x00

Command to GET monitor responsivity value 47,5uA/mW:

0x001	0x08	0x97	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Response ANSWER:

0x022	0x08	0x97	0x01	0x00	0x00	0x00	0x00	0x12	0x8E

Value = (0x128E) = 4750 /100 = 47,5uA/mW;

</td><td>R/W</td></tr>
<tr><td>0x21</td><td>

TEC on/off command

Value:

- 0 – turn TEC off
- 1 – turn TEC on

Example:
Command to SET TEC on:

0x001	0x08	0x21	0x00	0x00	0x00	0x00	0x00	0x00	0x01

Response ACK:

0x001	0x08	0x21	0x01	0x00	0x00	0x00	0x00	0x00	0x00

Command to GET TEC on/off state:

0x001	0x08	0xA1	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Response ANSWER:

0x022	0x08	0xA1	0x01	0x00	0x00	0x00	0x00	0x00	0x01

Value = 1;

</td><td>R/W</td></tr>
</table>

<table>
<tr><th>CMD</th><th>CMD description</th><th>Read/Write</th></tr>
<tr><td>0x24</td><td>

Laser emitting mode

Value: integer value where:

0x00: Internal CW mode
0x01: External ANALOG modulation mode mode
0x02: External TTL
0x03: COP (constant optical power) mode

Example:
Command to SET external ANALOG modulation mode:

0x001	0x08	0x24	0x00	0x00	0x00	0x00	0x00	0x00	0x01

Response ACK:

0x022	0x08	0x24	0x01	0x00	0x00	0x00	0x00	0x00	0x00

Command to GET internal CW mode value:

0x001	0x08	0xA4	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Response ANSWER:

0x022	0x08	0xA4	0x01	0x00	0x00	0x00	0x00	0x00	0x00

Value = (0x00) = Internal CW mode;

</td><td>R/W</td></tr>
<tr><td>0x25</td><td>

Laser diode maximum current command

Value: integer value bytes multiplied with 100

Example:
Command to SET maximum current value 1000mA,
Value = 1000 * 100 = 100000 (0x186A0):

0x001	0x08	0x25	0x00	0x00	0x00	0x00	0x01	0x86	0xA0

Response ACK:

0x022	0x08	0x25	0x01	0x00	0x00	0x00	0x00	0x00	0x00

Command to GET maximum current value 1000mA:

0x001	0x08	0xA5	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Response ANSWER:

0x022	0x08	0xA5	0x01	0x00	0x00	0x00	0x01	0x86	0xA0

Value = (0x186A0) = 100000 / 100 = 1000mA;

</td><td>R/W</td></tr>
</table>

<table>
<tr><th>CMD</th><th>CMD description</th><th>Read/Write</th></tr>
<tr><td>0x26</td><td>Laser diode minimum current command

Value: integer value bytes multiplied with 100

Example:
Command to SET minimum current value 10mA,
Value = 10 *100 = 1000 (0x03E8)
<table>
<tr><td>0x001</td><td>0x08</td><td>0x26</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x03</td><td>0xE8</td></tr>
</table>
Response ACK:
<table>
<tr><td>0x022</td><td>0x08</td><td>0x26</td><td>0x01</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td></tr>
</table>

Command to GET minimum current value 10mA:
<table>
<tr><td>0x001</td><td>0x08</td><td>0xA6</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td></tr>
</table>
Response ANSWER:
<table>
<tr><td>0x022</td><td>0x08</td><td>0xA6</td><td>0x01</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x03</td><td>0xE8</td></tr>
</table>
Value = (0x03E8) = 1000/100 =10mA;</td><td>R/W</td></tr>
<tr><td>0x33</td><td>Laser diode maximum TEC current command.

Value: integer value bytes multiplied with 10

Example:
Command to SET maximum TEC current value 4A,
Value = 4 * 10 = 40 (0x28):
<table>
<tr><td>0x001</td><td>0x08</td><td>0x33</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x28</td></tr>
</table>
Response ACK:
<table>
<tr><td>0x022</td><td>0x08</td><td>0x33</td><td>0x01</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td></tr>
</table>

Command to GET maximum TEC current value 4A:
<table>
<tr><td>0x001</td><td>0x08</td><td>0xB3</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td></tr>
</table>
Response ANSWER:
<table>
<tr><td>0x022</td><td>0x08</td><td>0xB3</td><td>0x01</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x28</td></tr>
</table>
Value = (0x28) = 40 / 10 = 4A;</td><td>R/W</td></tr>
<tr><td>0x36</td><td>Minimum temperature command

Value: integer value multiplied with 10

Example:
Command to SET minimum temperature 20,0°C,
Value = 20,0 * 10 = 200 (0xC8):
<table>
<tr><td>0x001</td><td>0x08</td><td>0x36</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0xC8</td></tr>
</table>
Response ACK:
<table>
<tr><td>0x022</td><td>0x08</td><td>0x36</td><td>0x01</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td></tr>
</table>

Command to GET minimum temperature value:
<table>
<tr><td>0x001</td><td>0x08</td><td>0xB6</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td></tr>
</table>
Response ANSWER:
<table>
<tr><td>0x022</td><td>0x08</td><td>0xB6</td><td>0x01</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0xC8</td></tr>
</table>
Value = (0xC8) = 200 / 10 = 20°C;</td><td>R/W</td></tr>
</table>

<table>
<tr><th>CMD</th><th>CMD description</th><th>Read/Write</th></tr>
<tr><td>0x37</td><td>

Maximum temperature command

Value: integer value multiplied with 10

Example:
Command to SET maximum temperature 50,5°C,
Value = 50,5 * 10 = 505 (0x01F9):

0x001	0x08	0x37	0x00	0x00	0x00	0x00	0x00	0x01	0xF9

Response ACK:

0x022	0x08	0x37	0x01	0x00	0x00	0x00	0x00	0x00	0x00

Command to GET maximum temperature value:

0x001	0x08	0xB7	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Response ANSWER:

0x022	0x08	0xB7	0x01	0x00	0x00	0x00	0x00	0x01	0xF9

Value = (0x01F9) = 505 / 10 = 50,5°C;

</td><td>R/W</td></tr>
<tr><td>0x42</td><td>

Laser diode maximum power command

Value: integer value bytes multiplied with 10

Example:
Command to SET maximum power value 1000mW,
Value = 1000 * 10 = 10000 (0x2710):

0x001	0x08	0x42	0x00	0x00	0x00	0x00	0x00	0x27	0x10

Response ACK:

0x022	0x08	0x42	0x01	0x00	0x00	0x00	0x00	0x00	0x00

Command to GET maximum power value 1000mW:

0x001	0x08	0xC2	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Response ANSWER:

0x022	0x08	0xC2	0x01	0x00	0x00	0x00	0x00	0x27	0x10

Value = (0x2710) = 10000 / 10 = 1000mW;

</td><td>R/W</td></tr>
<tr><td>0x43</td><td>

Laser diode minimum power command

Value: integer value bytes multiplied with 10

Example:
Command to SET minimum power value 10mW,
Value = 10 * 10 = 100 (0x64):

0x001	0x08	0x43	0x00	0x00	0x00	0x00	0x00	0x00	0x64

Response ACK:

0x022	0x08	0x43	0x01	0x00	0x00	0x00	0x00	0x00	0x00

Command to GET minimum power value 10mW:

0x001	0x08	0xC3	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Response ANSWER:

0x022	0x08	0xC3	0x01	0x00	0x00	0x00	0x00	0x00	0x64

Value = (0x64) = 100 / 10 = 10mW;

</td><td>R/W</td></tr>
</table>

<table>
<tr><th>CMD</th><th>CMD description</th><th>Read/Write</th></tr>
<tr><td>0x44</td><td>

Coefficient P command

Value: integer value multiplied with 10000

Example:
Command to SET coefficient P,
Value = 10000,0000 * 10000 = 100000000 (0x05F5E100):

0x001	0x08	0x44	0x00	0x00	0x00	0x05	0xF5	0xE1	0x00

Response ACK:

0x022	0x08	0x44	0x01	0x00	0x00	0x00	0x00	0x00	0x00

Command to GET coefficient P value:

0x001	0x08	0xC4	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Response ANSWER:

0x022	0x08	0xC4	0x01	0x00	0x00	0x05	0xF5	0xE1	0x00

Value = (0x05F5E100) = 100000000 / 10000 = 10000;

</td><td>R/W</td></tr>
<tr><td>0x45</td><td>

Coefficient I command

Value: integer value multiplied with 10000

Example:
Command to SET coefficient I,
Value = 1000,0000*10000 = 10000000 (0x989680):

0x001	0x08	0x45	0x00	0x00	0x00	0x00	0x98	0x96	0x80

Response ACK:

0x022	0x08	0x45	0x01	0x00	0x00	0x00	0x00	0x00	0x00

Command to GET coefficient I value:

0x001	0x08	0xC5	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Response ANSWER:

0x022	0x08	0xC5	0x01	0x00	0x00	0x00	0x98	0x96	0x80

Value = (0x00989680) = 10000000 / 10000 = 1000;

</td><td>R/W</td></tr>
<tr><td>0x46</td><td>

Coefficient D command

Value: integer value multiplied with 10000

Example:
Command to SET coefficient D,
Value = 2000,0000*10000 = 20000000 (0x01312D00):

0x001	0x08	0x46	0x00	0x00	0x00	0x01	0x31	0x2D	0x00

Response ACK:

0x022	0x08	0x46	0x01	0x00	0x00	0x00	0x00	0x00	0x00

Command to GET coefficient D value:

0x001	0x08	0xC6	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Response ANSWER:

0x022	0x08	0xC6	0x01	0x00	0x00	0x01	0x31	0x2D	0x00

Value = (0x0131 2D00) = 20000000 / 10000 = 2000;

</td><td>R/W</td></tr>
</table>

<table>
<tr><th>CMD</th><th>CMD description</th><th>Read/Write</th></tr>
<tr><td>0x50</td><td>Device type command

Value: PLD-CW-2000 device type = 0x0E

Example:
Command to GET device type:
<table><tr><td>0x001</td><td>0x08</td><td>0xD0</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td></tr></table>Response ANSWER:
<table><tr><td>0x022</td><td>0x08</td><td>0xD0</td><td>0x01</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x0E</td></tr></table>Value = (0x0E) = PLD-CW-2000;</td><td>R</td></tr>
<tr><td>0x51</td><td>CAN identificator command

Example:
Command to SET base ID using BROADCAST ID,
Value = 1:
<table><tr><td>0x001</td><td>0x08</td><td>0x51</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x01</td></tr></table>Response ACK:
<table><tr><td>0x022</td><td>0x08</td><td>0x51</td><td>0x01</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td></tr></table>
Command to GET base ID using BROADCAST ID:
<table><tr><td>0x001</td><td>0x08</td><td>0xD1</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td></tr></table>Response ANSWER:
<table><tr><td>0x022</td><td>0x08</td><td>0xD1</td><td>0x01</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x01</td></tr></table>Base ID = 0x01;</td><td>R/W</td></tr>
<tr><td>0x52</td><td>Save parameters command

Example:
Command to save parameters in FLASH memory:
<table><tr><td>0x001</td><td>0x08</td><td>0x52</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td></tr></table>Response ACK:
<table><tr><td>0x022</td><td>0x08</td><td>0x52</td><td>0x01</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td></tr></table></td><td>W</td></tr>
</table>