PLD-NS RS232 protocol description

RS232 configuration

Baud rate: 57600 baud/sec
Data bits: 8 bit
Parity: no parity
Stop bits: 1 bit

Command format description

Command and response is a text string that has the following structure:
<Message header><data><crc16><CR> … 100 milliseconds timeout …
Where:

- Message header is “t0018” for command and “t0228” for response
- Data – is a packet of Ascii characters with hexadecimal values; For example “01000000fffefdfc”. Numbers of characters must be equal to 16 (8 pairs of characters);
- Crc16 - checksum value represented by 4 Ascii characters;
- <CR> - carriage return byte.

NOTE: 100 milliseconds timeout between commands is necessary to provide stable device work.

Data format description

<cmd><id><res><res><value_4><value_3><value_2><value_1> <CRC_2><CRC_1>
Where:

- <cmd> - set/get command byte (HEX) or response byte (HEX)
- <id> - device ID if response data, if command – “00”
- <res> - reserved byte (HEX)
- <value_4> - value byte 4 (HEX)
- <value_3> - value byte 3 (HEX)
- <value_2> - value byte 2 (HEX)
- <value_1> - value byte 1 (HEX)
- <CRC_2> - checksum byte 2 (HEX)
- <CRC_1> - checksum byte 1 (HEX)

CRC16 description

The MODBUS algorithm is used to calculate the packet checksum.
CRC16 algorithm parameters:

- Poly: 0x8005
- Init: 0xffff
- Reflect In: true
- Reflect Out: true
- XorOut: 0xffff

CRC16 example:

“t0028a12200000000000088f9\r”

Where: 0x88f9 is a checksum for packet (“t0028a122000000000000”)

NOTE: If the command does not contain any checksum characters (“t0028a122000000000000\r”) command will be executed without check;

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 description

1. Laser temperature command

<cmd> = 0x12 SET command byte
<value_4><value_3><value_2><value_1> - temperature value bytes multiplied with 10;
Example:
Set laser current 25,2°C command
(value = 25,2*10 = 252 = 0x000000FC):

```
"t00181200000000000FC\r"        - SET command

"t02281201000000000000CF9\r"    - ACK response
```

Get laser temperature command:

```
"t00189200000000000000\r"       - GET command

"t022892010000000000FC4F99\r"   - ACK response with value 0xFC
```

Value 0x000000FC (252) is multiplied with 10, so the result value is 252/10 = 25,2°C.

2. Thermistor beta command

<cmd> = 0x15 SET command byte
<value_4><value_3><value_2><value_1> - thermistor beta value bytes;
Example:
Set thermistor beta 3984 (0x0F90) command

```
"t00181500000000000F90\r"       - SET command

"t02281501000000000000EBE\r"    - ACK response
```

Get thermistor beta value command:

```
"t00189500000000000000\r"       - GET command

"t02289501000000000F90425E\r"   - ACK response with

value 0x0F90;
```

3. Thermistor resistance command

<cmd> = 0x16 SET command byte
<value_4><value_3><value_2><value_1> - thermistor resistance at 25°C value bytes;
Example:
Set thermistor resistance 10000 Ohm (0x2710) command

```
"t00181600000000002710\r"       - SET command

"t02281601000000000000FFD\r"    - ACK response
```

Get thermistor resistance value command:

```
"t00189600000000000000\r"       - GET command

"t02289601000000002710204B\r"   - ACK response with

value 0x2710;
```

4. Laser current command

<cmd> = 0x18 SET command byte
<value_4><value_3><value_2><value_1> - laser current value bytes multiplied with 100;
Example:
Set laser current 1.7 V command
(value = 1.7*100 = 170 = 0x00004E20):

```
"t00181800000000000AA\r"        - SET command

"t02281801000000000000B73\r"    - ACK response
```

Get laser current value command:

```
"t00189800000000000000\r"       - GET command

"t022898010000000000AAB990\r"   - ACK response with

value 0xAA;
```

NOTE: Value 0x000000AA (170) is multiplied with 100, so the result value is 170/100 = 1.7 A.

5. Output frequency for internal generation command

<cmd> = 0x19 SET command byte
<value_4><value_3><value_2><value_1> - output frequency value bytes;
Note: the frequency should be set in increments corresponding to the following ranges

- 1 Hz increment for frequencies from range 1…1000 Hz
- 1000 Hz increment for frequencies from range 1kHz … 1MHz
- 100000 Hz increment for frequencies from range 1MHz … 30MHz

Example:
Set frequency value 20.1 MH command
(value = 20100000 = 0x0132B3A0):

```
"t0018190000000132B3A0\r"          - SET command
"t022819010000000000000BB2\r"      - ACK response
```

Get frequency value command:

```
"t0018990000000000000\r"           - GET command
"t0228990100000132B3AD613\r"       - ACK response with
value 0x0132B3A0;
```

NOTE: Value 0x0132B3A0 (20100000), so the result value is 20100000 Hz.

6. Laser diode voltage on/off command

<cmd> = 0x20 SET command byte
<value_1> = 0x00 to turn laser diode voltage off
<value_1> = 0x01 to turn laser diode voltage on
Example:
Turn on laser diode voltage command:

```
"t0018200000000000001\r"           - SET command
"t022820010000000000FC3B\r"        - ACK response
```

Get on/off laser diode voltage state command:

```
"t0018A000000000000000\r"          - GET command
"t0228A001000000000001299F\r"      - ACK response with value 1;
```

7. TEC on/off command

TEC on/off command works only if laser diode has TEC.
<cmd> = 0x21 SET command byte
<value_1> = 0x00 to turn TEC off
<value_1> = 0x01 to turn TEC on
Example:
Turn on TEC command:

```
"t0018210000000000001\r"           - SET command
"t022821010000000000FCFA\r"        - ACK response
```

Get on/off TEC state command:

```
"t0018A100000000000000\r"          - GET command
"t0228A101000000000001295E\r"      - ACK response with value 1;
```

8. On/off laser pulse emitting command

<cmd> = 0x22 SET command byte
<value_1> = 0x00 to turn laser pulse emitting off
<value_1> = 0x01 to turn laser pulse emitting on
Example:
Turn on laser pulse emitting command command:

```
"t0018220000000000001\r"           - SET command
"t022822010000000000FDB9\r"        - ACK response
```

Get on/off laser pulse emitting command state command:

```
"t0018A200000000000000\r"          - GET command
"t0228A201000000000001281D\r"      - ACK response with value 1;
```

9. Output pulse duration command

<cmd> = 0x23 SET command byte
<value_4><value_3><value_2><value_1> output pulse duration value bytes (1ns - 100ns) multiplied with 10;
Note: the output maximum duty cycle should be 2%
Example:
Set duration 68,1 ns command
(value = 68,1*10 = 681 = 0x000002A9):

```
"t00182300000000002A9\r"          - SET command
"t02282301000000000000FD78\r"     - ACK response
```

Get duration value command:

```
"t0018A300000000000000\r"         - GET command
"t0228A3010000000002A97E58\r"     - ACK response with
value 0x02A9;
```

NOTE: Value 0x000002A9 (681) is multiplied with 10, so the result value is 681/10 = 68,1 ns.

10. Mode command

<cmd> = 0x24 SET command byte
<value_1> = 0x00 Internal generation
<value_1> = 0x01 Pulse on demand mode
<value_1> = 0x02 External generation mode
Example:
Set pulse on demand mode command:

```
"t00182400000000000001\r"         - SET command
"t02282401000000000000FF3F\r"     - ACK response
```

Get mode command:

```
"t0018A400000000000000\r"         - GET command
"t0228A4010000000000012A9B\r"     - ACK response with value 1 – Pulse on demand
mode;
```

11. Maximum current command

<cmd> = 0x25 SET command byte
<value_4><value_3><value_2><value_1> - maximum current value bytes multiplied with 100;
Example:
Set laser maximum current 2 A command
(value = 2*100 = 200 = 0x000000C8):

```
"t00182500000000000C8\r"          - SET command
"t02282501000000000000FFFE\r"     - ACK response
```

Get maximum laser current value command:

```
"t0018A500000000000000\r"         - GET command
"t0228A5010000000000C81CBF\r"     - ACK response with
value 0x82;
```

NOTE: Value 0x000000C8 (200) is multiplied with 100, so the result value is 200/100 = 2 A.

12. Minimum current command

<cmd> = 0x26 SET command byte
<value_4><value_3><value_2><value_1> - minimum current value bytes multiplied with 100;
Example:
Set laser minimum current 0,1 A command
(value = 0,1*100 = 10 = 0x0000000A):

```
"t00182600000000000000A\r"        - SET command
"t02282601000000000000FEBD\r"     - ACK response
```

Get minimum laser current value command:

```
"t0018A600000000000000\r"         - GET command
```

```
"t0228A60100000000000ACF18\r"     - ACK response with
value 0x0A;
```

NOTE: Value 0x0000000A (10) is multiplied with 100, so the result value is 10/100 = 0,1 A.

13. Gated pulses for burst generation command

<cmd> = 0x34 SET command byte
<value_4><value_3><value_2><value_1> - count of gated value bytes;
Example:
Set 10 gated pulses (0x0A) command:

```
"t00183400000000000A\r"           - SET command
"t022834010000000000006FFE\r"     - ACK response
```

Get gated pulses value command:

```
"t0018B400000000000000\r"         - GET command
"t0228B40100000000000A3FDA\r"     - ACK response with
value 0x0A;
```

NOTE: Value 0x0000000A (10), so the result value is 10 gated pulses.

14. Blocked pulses for burst generation command

<cmd> = 0x35 SET command byte
<value_4><value_3><value_2><value_1> - count of blocked value bytes;
Example:
Set 15 blocked pulses (0x0A) command:

```
"t00183500000000000A\r"           - SET command
"t022835010000000000006F3F\r"     - ACK response
```

Get blocked pulses value command:

```
"t0018B500000000000000\r"         - GET command
"t0228B50100000000000FFD5A\r"     - ACK response with
value 0x0F;
```

NOTE: Value 0x0000000F (15), so the result value is 15 blocked pulses.

15. Minimum temperature command

<cmd> = 0x36 SET command byte
<value_4><value_3><value_2><value_1> - minimum temperature value bytes multiplied with 10;
Example:
Set minimum temperature 20°C command
(value = 20*10 = 200 = 0x000000C8):

```
"t00183600000000000C8\r"          - SET command
"t022836010000000000006E7C\r"     - ACK response
```

Get minimum temperature value command:

```
"t0018B600000000000000\r"         - GET command
"t0228B6010000000000C8ECBC\r"     - ACK response with
value 0x00C8;
```

NOTE: Value 0x000000C8 (200) is multiplied with 10, so the result value is 200/10 = 20°C.

16. Maximum temperature command

<cmd> = 0x37 SET command byte
<value_4><value_3><value_2><value_1> - maximum temperature value bytes multiplied with 10;
Example:
Set maximum temperature 50,5°C command
(value = 50,5*10 = 505 = 0x000001F9):

```
"t00183700000000001F9\r"          - SET command
"t022837010000000000006EBD\r"     - ACK response
```

Get maximum temperature value command:

```
"t0018B700000000000000\r"          - GET command
"t0228B7010000000001F9BCEE\r"      - ACK response with
value 0x01F9;
```

NOTE: Value 0x000001F9 (505) is multiplied with 10, so the result value is 505/10 = 50,5°C.

17. Nominal voltage command

<cmd> = 0x38 SET command byte
<value_4><value_3><value_2><value_1> - nominal voltage value bytes multiplied with 100;
Example:
Set nominal voltage 20 V command
(value = 20*100 = 2000 = 0x000007D0):

```
"t00183800000000007D0\r"           - SET command
"t022838010000000000006AF2\r"      - ACK response
```

Get maximum temperature value command:

```
"t0018B800000000000000\r"          - GET command
"t0228B8010000000007D0B8A1\r"      - ACK response with
value 0x07D0;
```

NOTE: Value 0x000007D0 (2000) is multiplied with 100, so the result value is 2000/100 = 20 V.

18. Coefficient P command

<cmd> = 0x44 SET command byte
<value_4><value_3><value_2><value_1> - coefficient P value bytes multiplied with 10000;
Example:
Set coefficient P 10000 command
(value = 10000*10000 = 100000000 = 0x05F5E100):

```
"t00184400000005F5E100\r"          - SET command
"t022844010000000000005DBC\r"      - ACK response
```

Get coefficient P value command:

```
"t0018C400000000000000\r"          - GET command
"t0228C401000005F5E1001102\r"      - ACK response with
value 0x05F5E100;
```

NOTE: Value 0x05F5E100 (100000000) is multiplied with 10000, so the result value is 100000000/10000 = 10000.

19. Coefficient I command

<cmd> = 0x45 SET command byte
<value_4><value_3><value_2><value_1> - coefficient I value bytes multiplied with 10000;
Example:
Set coefficient I 1000 command
(value = 1000*10000 = 10000000 = 0x989680):

```
"t00184500000000989680\r"          - SET command
"t022845010000000000005D7D\r"      - ACK response
```

Get coefficient I value command:

```
"t0018C500000000000000\r"          - GET command
"t0228C50100000009896808E1F\r"     - ACK response with
value 0x00989680;
```

NOTE: Value 0x00989680 (10000000) is multiplied with 10000, so the result value is 10000000/10000 = 1000.

20. Coefficient D command

<cmd> = 0x46 SET command byte
<value_4><value_3><value_2><value_1> - coefficient D value bytes multiplied with 10000;
Example:
Set coefficient D 2000 command
(value = 2000*10000 = 20000000 = 0x01312D00):

```
"t00184600000001312D00\r"          - SET command

"t02284601000000000005C3E\r"       - ACK response
```

Get coefficient D value command:

```
"t0018C600000000000000\r"          - GET command

"t0228C601000001312D001B35\r"      - ACK response with

value 0x01312D00;
```

NOTE: Value 0x01312D00 (20000000) is multiplied with 10000, so the result value is 20000000/10000 = 2000.

21. Device type command

<cmd> = 0xD0 GET command byte
Example:
Get device type command:

```
"t0018D000000000000000\r"          - GET command

"t0228D001000000000017E8DD\r"      - ACK response with

value 0x17
```

NOTE: Value 0x00000017 (23), so device type is PLD-NS.

22. CAN identificator command

<cmd> = 0x51 SET command byte
<value_4><value_3><value_2><value_1> - bytes of CAN ID value;
Example:
Command to set base ID using BROADCAST ID
(value = 0x01):

```
"t00185100000000000001\r"          - SET command

"t02285101000000000000CEB8\r"      - ACK response
```

Get CAN ID command:

```
"t0018D100000000000000\r"          - GET command

"t0228D101000000000017A9D\r"       - ACK response with

value 0x01.
```

23. Save parameters command

<cmd> = 0x52 SET command byte
Example:
Command to save parameters in FLASH memory

```
"t00185200000000000000\r"          - SET command

"t02285201000000000000CFFB\r"      - ACK response
```