OMNICOMM

Omnicomm LLS Fuel Level Sensor

Integration manual

18.07.2019

Contents

Omnicomm LLS Fuel Level Sensor

General information

Integration manual contains guidelines on integration of Omnicomm LLS fuel level sensors into the systems of monitoring and control of transport of different manufacturers (the external devices).

Omnicomm Fuel Level Sensor Description

Information exchange with the sensor is permormed via interface RS-232 or RS-485. The sensor supports exchange speed from 1200 to 115200 bit/sec. Default value is 19200 bit/sec.

Omnicomm LLS sensor can work in two modes:

1. In the slave mode Omnicomm LLS sensor responses to all requests from the master device in the network. Each Omnicomm LLS sensor in the network shall be assigned with a network address

To switch on slave mode on Omnicomm Configurator, set the following parameters:

•Automatic data output — no

•Network addresses of Omnicomm LLS fuel level sensors

2. The master mode can be used only if one LLS sensor is connected to the external device. In this mode the sensor without request from the external device sends package with data on measured level of fuel and temperature

To switch on master mode on Omnicomm Configurator set the following parameters:

•Automatic data output — binary or character-coded

•Data output interval

Requirements to External Devices

External device shall have a continuous interface RS-485 or RS-232 and support Omnicomm LLS protocol.

Exchange Protocol Description

The protocol supports two types of exchange protocols: binary (HEX) and character view (transmission of ASCIIsequences). It is recommended to use binary exchange protocol.

After the power is supplied to Omnicomm LLS fuel level sensor and before the first command of the request it is required to wait for at least 100 ms.

When working with Omnicomm LLS being in the slave mode, after sending the request command it is required to wait for the response from the sensor. The time of response delay depends on exchange speed and type of exchange protocol (100 ms maximum).

The data between the sensor and external device are transferred in the form of messages (bits packages). The transmission of each byte begins with the START bit and terminates with the STOP bit:

The data are transmitted with a lower byte ahead.

The time interval between consecutive bytes in the packet (Tт) must be either shorter than the duration of a 35-bit transmission or less than 1 ms (if the speed is 35/<1 ms) than the duration of a 35-bit transmission or less than 1 ms (if the speed is 35</1 ms)

Tbyte is time of transmission of one byte of information;

Tt is an iterval between the consecutive bytes in the packet.

The end bytes packet is when the following byte does not arrive during time (Tp) exceeding maximum interval (Tt) = 1 ms.

Description of Binary Exchange Protocol Commands

Format of Binary Protocol Messages

All the commands of the binary communication protocol have the same standardized format which is given in the Table:

Sequential number of the field	Field name	Field size, byte	Description

Exchange Protocol Description

Sequential number of the field	Field name	Field size, byte	Description
1	Prefix	1	The field is a marker of the message beginning shall have prefix 31h, and an outcoming messages shall be displayed with 3Eh prefix by the program.
2	Network address	1	For prefix 31h specify the network address of the recipient For prefix 3Eh specify the network address of the sender
3	Operation code	1	For prefix 31h specify the code of operation which the program shall perform For Eh prefix specify the code of operation to which the response is given
4	Data	It depends on the operation code	Data composition and format of the field depends on the operation code
5	Checksum	1	The field is used to control over data integrity

Single-Stage Data Reading (command 06h)

The command is designed for reading of the current data: relative level, temperature, frequency. The data are transmitted with a lower byte ahead.

Command format:

Exchange Protocol Description

Offset, bytes	Field size, bytes	Value	Description
0	1	31h	Prefix
+1	1	00h..FFh	Network address of the recipient
+2	1	06h	Operation code
+3	1	00h..FFh	The checksum

Response format:

Offset, bytes	Field size, bytes	Value	Description
0	1	3Eh	Prefix
+1	1	00h..FFh	Network address of recipient
+2	1	06h	Operation code
+3	1	-128…127	Temperature in in degrees Celsius
+4	2	0000h…FFFFh	Relative level
+6	2	0000h…FFFFh	Frequency value
+8	1	00h..FFh	Checksum

Periodic Data Output (command 07h)

Command is designed to switch on periodic data output.

After the command is processed, the sensor starts sending data periodically — level,

temperature, and frequency — with the time interval prescribed by the 13h command.

Turning off of the periodic data output is performed after receipt of any true command, reset of the processor or disconnection of power power supply (if the data output mode is not istalled by default).

Command format:

Offset, bytes	Field size, bytes	Value	Description
0	1	31h	Prefix
+1	1	00h..FFh	The Network address of the sender
+2	1	07h	Operation code
+3	1	00h..FFh	Checksum

Response format:

Offset, bytes	Field size, bytes	Value	Description
0	1	3Eh	Prefix
+1	1	00h..FFh	Network address of recipient
+2	1	07h	Operation code
+3	1	00h	The command has been executed successfully
			The command cannot be executed
+4	1	00h..FFh	Checksum

Exchange Protocol Description

Periodic data output format:

Offset, bytes	Field size, bytes	Value	Description
0	1	3Eh	Prefix
+1	1	00h..FFh	The Network address of the sender
+2	1	07h	Operation code
+3	1	-128…127	Temperature in in degrees Celsius
+4	2	0000h…FFFFh	Relative level
+6	2	0000h…FFFFh	Frequency value
+8	1	00h..FFh	Checksum

Periodic Data Output Interval Adjustment (13h command)

Command is designed to set up interval of periodic data output.

Command format:

Offset, bytes	Field size, bytes	Value	Description
0	1	31h	Prefix
+1	1	00h..FFh	Network address of the recipient
+2	1	13h	Operation code

Default Data Output Mode (command 17h)

Offset, bytes	Field size, bytes	Value	Description
+3	1	0…255	Interval of the data output in seconds
+4	1	00h..FFh	Checksum

Response format:

Offset, bytes	Field size, bytes	Value	Description
0	1	3Eh	Prefix
+1	1	00h..FFh	The Network address of the sender
+2	1	13h	Operation code
+3	1	00h	The command has been executed successfully
+3	1	01h	The command cannot be executed
+4	1	00h..FFh	Checksum

Default Data Output Mode (command 17h)

This command determines the order of data output after the sensor is powered on or the processor is reset. After the power is on or the processor is reset, the program will send data periodically via the interface at the time interval prescribed by the 13h command.

Command format:

Default Data Output Mode (command 17h)

Offset, bytes	Field size, bytes	Value	Description
0	1	31h	Prefix
+1	1	00h..FFh	Network address of the recipient
+2	1	17h	Operation code
+3	1	00h	No data output
+3	1	01h	The data are output in binary form
+3	1	02h	The data are output in character-coded form
+4	1	00h..FFh	Checksum

Response format:

Offset, bytes	Field size, bytes	Value	Description
0	1	31h	Prefix
+1	1	00h..FFh	Network address of the recipient
+2	1	17h	Operation code
+3	1	00h	The command has been executed successfully
+3	1	01h	The command cannot be executed

Offset, bytes	Field size, bytes	Value	Description
+4	1	00h…FFh	Checksum

Change Tracking of the Sensor Configuration Settings (0Fh)

The command allows to download the entire memory space containing the configuration change records for Omnicomm LLS 30160 sensor. The records format is given in the table. Only the first 5 records are fixed in the Rom, other are rewritten according to the the circular buffer rule. the remaining elements can be overwritten according to the circular buffer rule.

Command format:

Offset, bytes	Field size, bytes	Value	Description
0	1	31h	Prefix
+1	1	00h…FFh	The network address of the recipient
+2	1	0Fh	Operation code
+3	1	00h…FFh	Checksum

Change Tracking of the Sensor Configuration Settings (0Fh)

Response format:

Offset, bytes	Field size, bytes	Value	Description
0	1	3Eh	Prefix
+1	1	00h…FFh	The network address of the recipient
+2	1	0Fh	Operation code
+3	2	00h… FFFFh	The number of data bytes transmitted after the header (length)
+5	length	00h…FFh	Data
+5+length	1	00h…FFh	Checksum

Формат записи лога:

Offset, bytes	Field size, bytes	Value	Description
0	4	0h…FFFFFFFFh	Sequential number of the record
+4	2	0	The network address change
		1	Exchange rate change
		2	Nmin minimum value change
		3	Nmax maximum value change

Change Tracking of the Sensor Configuration Settings (0Fh)

Offset, bytes	Field size, bytes	Value	Description
		4	Filter length change
		5	Automatic output mode change
		6	Data output interval change
		7	CNT 1 change — empty
		8	CNT2 change — full
		0Ah	Programming the sensor
+6	4	0h…FFFFFFFFh	Configuration change time (unix time)
+10	4	0h…FFFFFFFFh	New parameter value
+14	1	00h…FFh	Checksum

Format of response to an error:

Offset, bytes	Field size, bytes	Value	Description
0	1	3Eh	Prefix
+1	1	00h…FFh	The Network address of the sender
+2	1	0Fh	Operation code
+3	1	01h	The command cannot be executed
+4	1	00h…FFh	Checksum

Filtration Rating Setting (10h command)

This command is intended to determine the value of the filter's length on Omnicomm LLS 30160 sensor.

Command format:

Offset, bytes	Field size, bytes	Value	Description
0	1	3Eh	Prefix
+1	1	00h..FFh	Network address of the recipient
+2	1	0Fh	Operation code
+3	1	00h..FFh	Cheksum

Response format:

Filtration Rating Setting (10h command)

Offset, bytes	Field size, bytes	Value	Description
0	1	3Eh	Prefix
+1	1	00h…FFh	The network address of the recipient
+2	1	10h	Operation code
+3	16	LLS 30160[1]	The name of the sensor. The type is a line constant. The value shall be set at the manufacturing plant during the PCB firmware.
+19	11	LLS 1.0.0.0[1]	Designation of the program and its version
+30	1	00h…03h	Data output mode
+31	1	00h…FFh	Interval of measurement results output
+32	1	0…20	Filter length
+33	2	0…4095	The lower limit for changes in level
+35	2	1…4095	Upper limit for changes in level
+37	3	000000h… FFFFFFh	CNT1 is the lower limit of the input signal period range
+40	3	000000h… FFFFFFh	CNT2 is the upper limit of the input signal period range
+43	1	00h…FFh	Checksum

[1] the name of the sensor, version number and firmware designation can be different from the given in the table.

Description of Commands for the Text-Based Protocol

Data exchange via the text-based protocol includes receipt and sending of ASCII symbols sequence interpreted and the request and response commands.

Reading the Data

The command is designed for reading of the current data: relative level, temperature, frequency.

The command is a sequence of symbols ASCII “D” and “O”. After receipt of the “DO” command the program will response in the form of ASCII symbols sequence.

For example, F=0AF9 t=1A N=03FF.0 <CR><LF>, where F is the current frequency value, t is the current value of temperature in Celcius degrees, N is the level value. All values are in hexadecimal form.

In case the frequency value exceeds FFFh, the data are considered invalid.

Periodic Data Output

The command is designed to switch on periodic data output. After processing the command the sensor performs periodic data output in the text-based form (ASCII codes) of the following data: relative level, temperature, frequency.

The data are being output periodically with an interval set up when cofiguring the sensor (Omnicomm Configurator software). In case the data output interval is set to zero, the data output won't be performed.

Switching on of the periodic data output is done by sending of the “DP” symbols in line. After processing of the command the symbols line will be received. For example, F=0AF9 t=1A N=03FF.0 <CR><LF>, where F is the current frequency value, t is the current value of temperature in Celcius degrees, N is the level value. Turning off of the periodic data output is performed after receipt of any true command, reset of the processor or disconnection of power supply.

Checksum Calculation Algorithm

The checksum is calculated using Dallas APPLICATION NOTE 27 table method: Understanding and Using Cyclic Redundancy Checks with Dallas Semiconductor iButton Products. One can use the following algorithms to calculate the checksum with a polynom ^8 + a^5 + a^4 + 1 (C language):

Version 1:

```
1 U8 CRC8 (U8 b, U8 crc)
2 {
3   U8 i = 8;
4   do {
5    if ( (b ^ crc) & 0x01) {
6     crc = ( (crc ^ 0x18) >> 1 ) | 0x80;
7    } else {
8     crc >>= 1;
9    }
10   b >>= 1;
11  } while (--i);
12  return crc;
13 }
```

Version 2:

```
1 U8 CRC8(U8 data, U8 crc)
2 {
3   U8 i = data ^ crc;
4   crc = 0;
5   if(i & 0x01) crc ^= 0x5e;
6   if(i & 0x02) crc ^= 0xbc;
7   if(i & 0x04) crc ^= 0x61;
8   if(i & 0x08) crc ^= 0xc2;
9   if(i & 0x10) crc ^= 0x9d;
10  if(i & 0x20) crc ^= 0x23;
11  if(i & 0x40) crc ^= 0x46;
12  if(i & 0x80) crc ^= 0x8c;
13  return crc;
14 }
```

OMNICOMM

info@omnicomm-world.com
www.omnicomm-world.com