

# Protocol of SOJI Fuel level sensor FJ-RS232/FJ-RS485 Version 1.0.2

## Document preparation

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## Revision history

Revision No	Effective date	Description
1	1 October 2016	First release
2	15 November 2016	Changed some commands
3	22 May 2017	Added Modbus RTU register mapping

## General info and specifications

Items	Specifications
Interface standard	RS232/RS485
Communication system	Half-duplex communication system
Parity	No parity
Error control system	CRC-8
Transmission distance	500m(RS485), 15m(RS232)

## 1. SOJI Protocol

### Request

0x31	Adr	Fmt	Data	CS
1 byte	1 byte	1 byte	[0 - 128] byte	1 byte

where

- **Adr**: address of sensor in the network
- **Fmt**: type of request
- **Data**: Field data
- **CS**: checksum by CRC8 method

### Response

0x3e	Adr	Fmt	Data	CS
1 byte	1 byte	1 byte	[0-128] byte	1 byte

where

- **Adr**: address of sensor in the network
- **Fmt**: type of request

- Data: Field data

- CS: checksum by CRC8 method

Format		Request Data			Response Data		
Request code	Description	Type	Description	Unit data	Type	Description	Unit data
<b>General information</b>							
0x02	Reading of serial number	-	-	-	U32	Sensor ID - Last 4 byte of UUID	-
0x03	Record the sensor address in the network	U8	0 .. 254	-	U8	0x00 - without errors / 0x01 - with error	-
0x05	Reading completed configuration	-	-	-	U32	Sensor ID - Last 4 byte of UUID	-
					U32	Max. calibration frequency	Hz
					U32	Min. calibration frequency	Hz
					S16	Temperature correction coefficient K1	-
					S8	Additional coefficient of temperature correction k2	-
					U8	Sensor address in the network (T_NET_ADDRESS)	-
					U8	Autocalib mode (Enable=1, Disable=0)	-
					U8	Not used	-
					U16	Not used	-
					U32	Not used	-
0x1E	Reading the structure of additional settings	-	-	-	U16	Not used	-
					U8	Interval parameter filtration (10..120)	10 sec
					U8	Interval of automatic parameter delivery (0 .. 60)	5 sec
					U8	Periodic parameter delivery mode (0-Off, 1-Hex, 2-ASCII, 3- ASCII-EXT)	-
					U8	Parameter filtration mode (1 - Off/0 - On)	-
0x24	Reading the setting structure of output signal ranges	-	-	-	S16	Not used	-
					S16	Not used	-
					S16	Max value of the fuel height	0.1 mm
					S16	Min value of the fuel height	0.1 mm
					S16	Not used	-
					S16	Not used	-
					S16	Not used	-
					U8	Not used	-
					U8	Not used	-
<b>Firmware information</b>							

0x1A	Reading the date of firmware compilation	-	-	-	U8 dim[12]	Line	-
0x1B	Reading the time of firmware compilation	-	-	-	U8 dim[10]	Line	-
0x1C	Reading the firmware version	-	-	-	U8 dim[3]	Line	-
<b>Reading data</b>							
0x06					S8	Temperature in sensor board	°C
					U16	Relative fuel level - Fuel level in cond. unit (0 - 4095)	-
						- Fuel level in mm [0.1mm] - Fuel volume in tank [0.1 l] - Fuel volume in the tank [0.4%]	0.1mm 0.1 l 0.4%
U16	Current frequency of oscillator	Hz					
0x1F					S8	Temperature > 0, Error code < 0	°C
					S16	Relative fuel level - Fuel level in cond. unit (0 - 4095)	1
						- Fuel level in mm [0.1mm] - Fuel volume in tank [0.1 l] - Fuel volume in the tank [0.4%]	0.1mm 0.1 l 0.4%
U32	Current frequency of oscillator	Hz					
0x23	Reading the working parameters				S16	Not used	-
					S16	Electronic board temperature	°C
					U32	Frequency of reference oscillator	Hz
					U32	Frequency of measuring oscillator, initial	Hz
					U32	Frequency of measuring generator, compensated	Hz
					S16	Height of fuel in conditional units	1 c.u.
					S16	Not used	-
					S16	Not used	-
					S16	Not used	-
					S16	Fuel volume in the tank	0.1 l
					S16	Not used	-
					S16	Not used	-
					S16	Not used	-
					U16	Height of fuel in the sensor, initial	0.1 mm
					U16	Height of fuel in the sensor, adjusted	0.1 mm
					U16	Height of fuel in the sensor, filtered	0.1 mm
					U16	Not used	-
U8	Fuel volume in the tank in % of its volume	0.4%					
U8	Not used	-					
U16	Not used	-					

Configuration							
0x08	Calib to minimum	-	-	-	U8	0x00 - without errors / 0x01 - with error	-
0x09	Calib to maximum	-	-	-	U8	0x00 - without errors / 0x01 - with error	-
0x0A	Record temperature correction	U16	Coefficient K1		U8	0x00 - without errors / 0x01 - with error	-
		S8	Addition coefficient K2				
0x0B	Record minimum calibration frequency	U32	Calibration frequency	1 Hz	U8	0x00 - without errors / 0x01 - with error	-
0x0C	Record maximum calibration frequency	U32	Calibration frequency	1 Hz	U8	0x00 - without errors / 0x01 - with error	-
0x11	Record filtration interval	U8	0 ... 60 sec	1 sec	U8	0x00 - without errors / 0x01 - with error	-
0x14	Read the filtration interval	-	-	-	U8	0 .. 120	1 sec
0x12	Set the access level of the installer	U8 dim[8]	Array of coded password	-	U8	0x00 - without errors / 0x01 - with error	-
0x15	Read the installer password	-	-	-	U8 dim[8]	Array of coded password	-
0x25	Record the setting structure of output signal ranges	S16	Not used	-	U8	0x00 - without errors / 0x01 - with error	-
		S16	Not used	-			
		S16	Max value of the fuel height	0.1 mm			
		S16	Min value of the fuel height in the sensor	0.1 mm			
		S16	Not used	-			
		S16	Not used	-			
		S16	Not used	-			
		U8	Not used	-			
U8	Not used	-					
Periodic mode							
0x07	Switch on pediodic delivery. Device stops when receive a valid request.	-	-	-	U8	0x00 - without errors / 0x01 - with error	-
0x13	Record interval of automatic parameter delivery	U8	0 .. 60	1 sec	U8	0x00 - without errors / 0x01 - with error	-
0x17	Record the periodic parameter delivery mode after reset (power supply)	U8	- 0 - OFF - 1 - HEX - 2 - ASCII	-	U8	0x00 - without errors / 0x01 - with error	-
0x34	Read ASCII-EXT prefix and postfix	-	-	-	struct{ U8 pre[30]; U8 post[30];}	Two lines of symbols, that end with "zero"	-
0x35	Record ASCII-EXT prefix and postfix	struct{ U8 pre[30]; U8 post[30];}	Two lines of symbols, that end with "zero"	-	U8	0x00 - without errors / 0x01 - with error	-

## Notes

- All write commands require access level 0x12

Types:

U8 - unsigned 8 bit value  
S8 - signed 8 bit value  
U16 - unsigned 16 bit value  
S16 - signed 16 bit value  
U32 - unsigned 32 bit value  
S32 - signed 32 bit value

## CRC error check

To calculate CRC Polynomial  $a^8 + a^5 + a^4 + 1$  the following algorithms can be used (C language):

U8 CRC8 (U8 data,U8 crc)

```
{  
U8 i = data ^ crc;  
crc = 0;  
if(i & 0x01) crc ^= 0x5e;  
if(i & 0x02) crc ^= 0xbc;  
if(i & 0x04) crc ^= 0x61;  
if(i & 0x08) crc ^= 0xc2;  
if(i & 0x10) crc ^= 0x9d;  
if(i & 0x20) crc ^= 0x23;  
if(i & 0x40) crc ^= 0x46;  
if(i & 0x80) crc ^= 0x8c;  
return crc;  
}
```

By tables method described in Dallas APPLICATION NOTE 27: Understanding and Using Cyclic Redundancy Checks with Dallas Semiconductor iButton Products

## 2. Modbus RTU Register Mapping

The SOJI sensor is capable of communication via the RS-485 serial bus in the Modbus/RTU protocol.

The sensor supports the Modbus function 03 – Read Holding Registers

No	Address	Type	Description	Unit data
1	0x00	U16	Sensor address	-
2	0x01	U16	Min calibration frequency - low bit	Hz
3	0x02	U16	Min calibration frequency - high bit	Hz
4	0x03	U16	Fuel level data (12 bit)	-
5	0x04	U16	Temperature	°C
6	0x05	U16	Reserved for future use	-
7	0x06	U16	Reserved for future use	-

8	0x07	U16	Max calibration frequency - low bit	Hz
9	0x08	U16	Max calibration frequency - high bit	Hz
10	0x09	U16	Reserved for future use	-
11	0x0A	U16	OSC current	Hz
12	0x0B	U16	OSC current	Hz